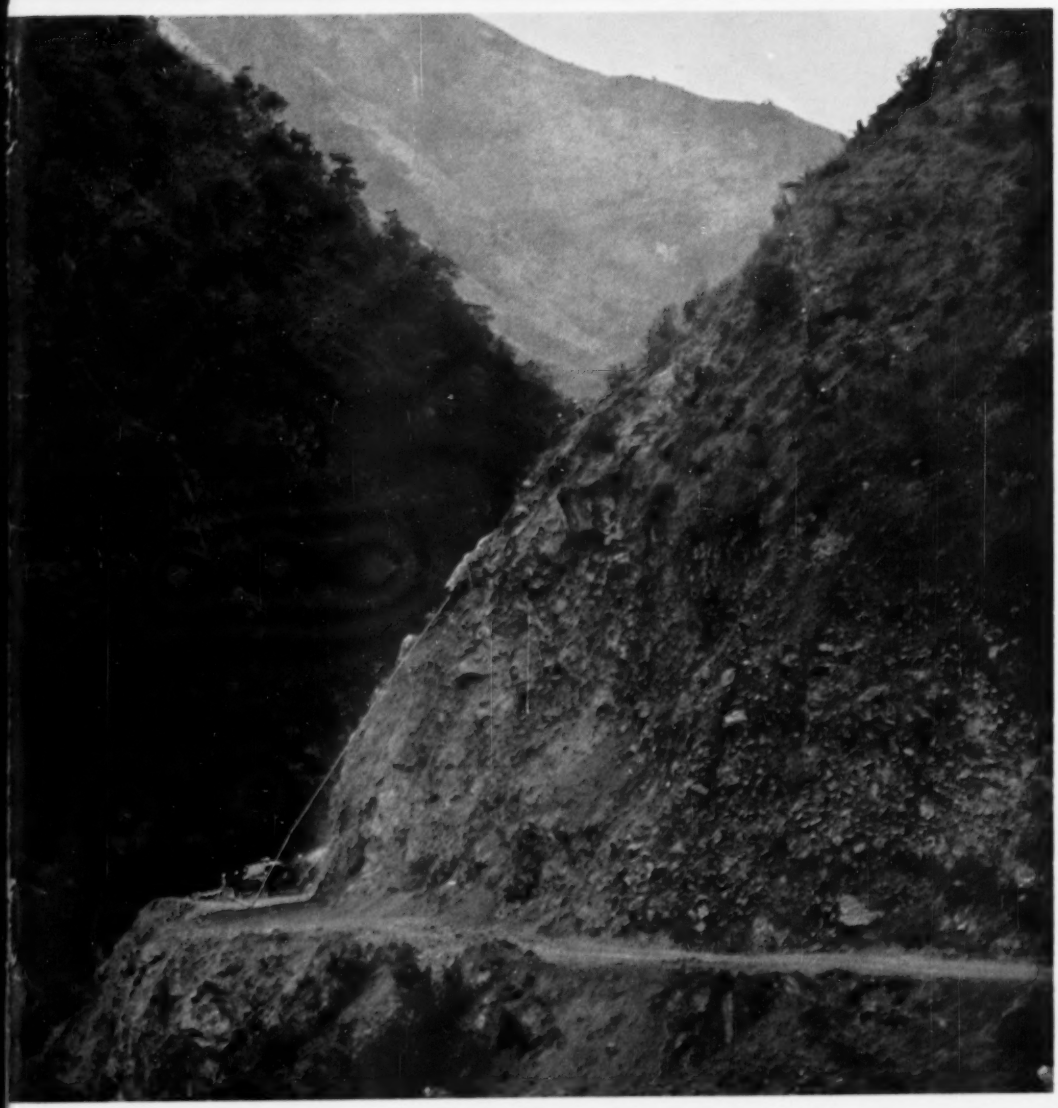
Compressed Air Magazine

MAY 1957



SKY HOOKS ARE IN ORDER HERE

Roadbuilders fighting for a foothold on steep slopes of Guatemala heights

(SEE PAGE 141)

PHOTO: HARRY E. HARPS

VOLUME 62 • NUMBER 5 NEW YORK • LONDON

LIGHTER IN WEIGHT . . . EASIER ON AIR

75-LB STOPEHAMER

saves time, effort and air on all up-hole drilling jobs

R-38A

. . . designed to take full advantage of longer-lasting, faster-drilling **CARSET JACKBITS**

The exceptionally light-weight and well-balanced design of the Ingersoll-Rand R-38A Stopehamer pays off in increased production. It not only weighs up to *26% less* than older-type stopers, but also uses *25% less compressed air.*

Built to stay underground this powerful, light-weight drill has automatic rotation, self-cleaning chuck, graduated throttle for easy collaring and protected exhaust ports. Ask your I-R representative for complete information on the cost-cutting R-38 Stopehamer.

Ingersoll-Rand

5-565

11 Broadway, New York 4, N. Y.

DRIFTERS · JACKDRILLS · JACKHAMERS · CRAWL-IR DRILLS · CARSET BITS · AIR TOOLS · COMPRESSORS

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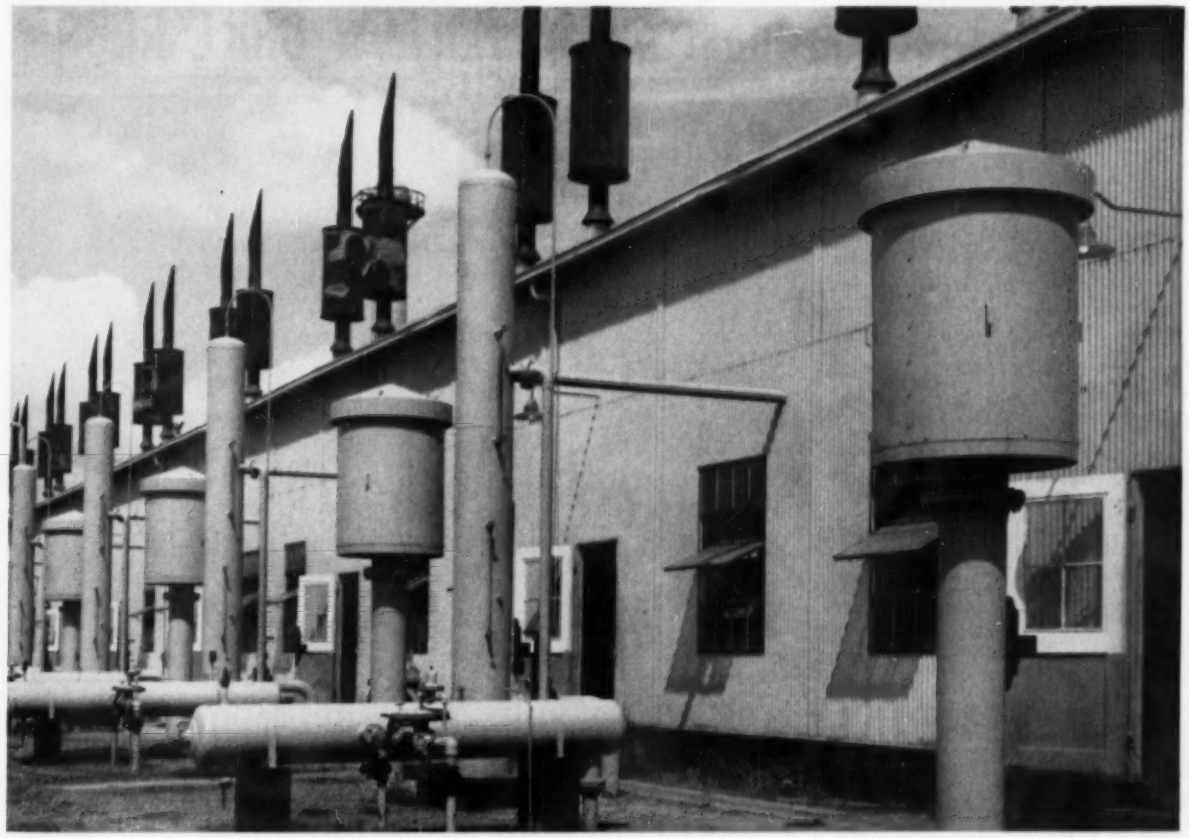

Partial view of a Falfurrias, Tex., gas plant showing four of eight Staynew air-intake filters that are effecting spectacular economies in maintenance costs for La Gloria Oil and Gas Co.

Filters Function Four Full Years Without Maintenance

In 1952 the Falfurrias, Tex., gas plant of La Gloria Oil and Gas Co. substituted two Staynew air-intake filters for conventional oil-bath filters on two gas-engine-driven, natural-gas compressors.

Two and a half years later the pressure drop through the Staynew filters had increased only to where it equalled the pressure drop of an oil-bath filter *immediately after an oil change.*

Air resistance was not yet enough to warrant cleaning. Therefore, La Gloria left the filters alone for another 19 months before deciding on an overhaul.

Oil-bath filters by comparison had required an oil change every 10 months, each change calling for *60 gallons of oil* and high labor costs.

As evidence of its satisfaction with Staynew filters, the company installed four more in 1954, another pair in 1955, and an additional three in 1956 to replace the last of the oil-bath filters.

The efficiency of Dollinger Staynew filters actually increases with use. So why buy filters that require rigid maintenance schedules? Let a Dollinger representative show you how to save time and money with Staynew Intake Filters, or write for Bulletin 100. Dollinger Corporation, 7 Centre Park, Rochester 3, N. Y.

PROTECTOMOTOR

STAYNEW DOLLINGER

FILTERS

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

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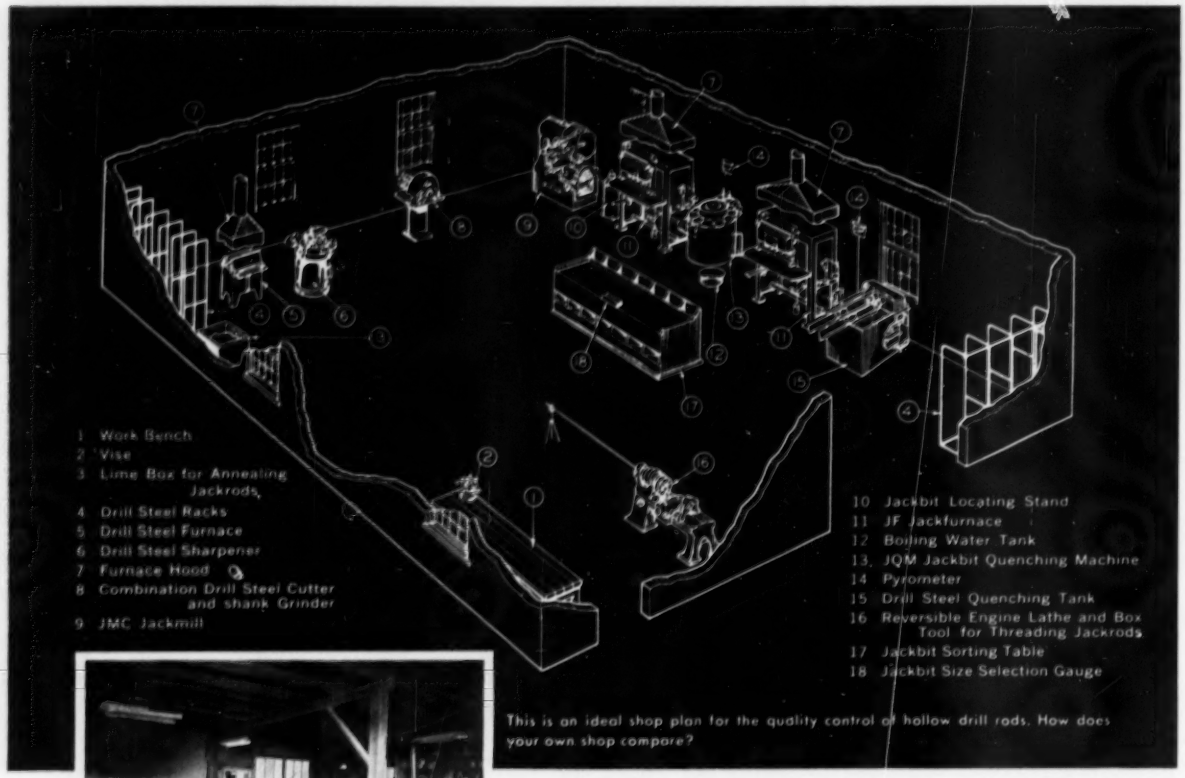
how to get the most out of HOLLOW DRILL RODS



This is an ideal shop plan for the quality control of hollow drill rods. How does your own shop compare?

Typical on the job arrangement.

To bring you the best drill rods possible, manufacturers spend many thousands of dollars each year in development and testing. Crucible, for example, put more than half a hundred different alloys through their paces before CA DOUBLE DIAMOND and 4E Alloy Hollow Drill Rods proved the answer to lower cost drilling.

But to get the most out of modern drill steels, you've got to *maintain* their fine quality *after they reach your shop.*

The Answer is Quality Control

Unintentional abuse of drill steel by improper forging, machining, heat treating and other shop operations, produces a rod that is bound to give poor performance.

That's why full time supervision on operations such as these can mean longer drill life on the job:

1. Check heat treating process. Overlap heats for proper time.
2. Check furnace and forging temperatures.
3. Check annealing process to insure correct hardness.
4. Check Rockwell hardness of shanks and thread ends.
5. Check fit of bits on newly threaded rods.
6. Check location and severity of metallurgical notch.
7. Examine all rods returned from the job and determine reason for failure.

Shop control of this type actually saves money by eliminating many rod failures on the job. Personnel will be enthusiastic in reporting improved rod performance, and you'll be getting lower cost per foot of hole drilled.

Your nearby Crucible representative will be glad to supply helpful information on other phases of drill rod care and operation – or arrange for *prompt* deliveries of hollow drill rods in the sizes, grades, and types you need. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

COPPUS "BLUE RIBBON" VENTILATORS

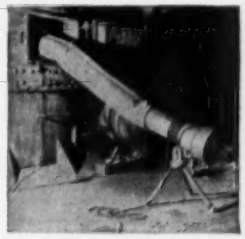
identified by the blue band

FOR WORKERS'

- *Safety*
- *Health*
- *Comfort*
- *Efficiency*

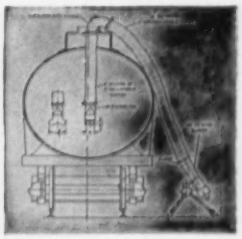
VANO Design "A" VENTILATOR

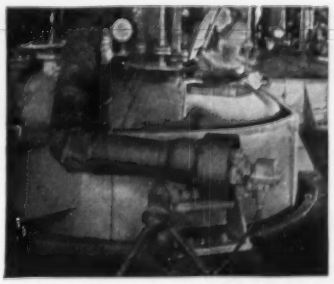
Vano Design "A" cooling interior of furnace, supplying fresh air through 10 feet of "Ventube" to provide safety and comfort during repair work.



Vano Design "A" delivering fresh air to cable manhole, expelling sewer gas, making entrance safe in a few minutes.

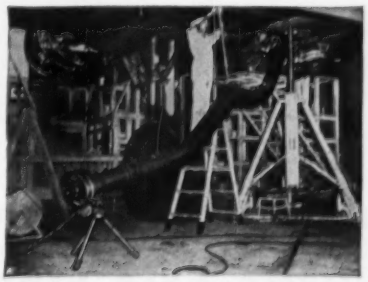
Vano Design "A" Ventilator plus a few accessories feeds large air volume into tank car, driving out fumes, stagnant or hot air for workers' safety and comfort.





Vano Design "A" supplying fresh air in Reactor Room of Synthetic Rubber Plant.

Vano Design "A" Ventilator supplying fresh air to men working in wing compartments, fuselages, etc.



Powered by a ½ hp motor, and equipped with the exclusive Coppus axial-flow propeller-type fan, this general-purpose blower delivers 1500 CFM of fresh air. It supplies ventilation for tanks, tank cars, drums, vats, underground cable manholes, pipe galleries, airplane wing compartments and fuselages, and other confined places. Weighs only 103 lbs. Uses 8"-diameter flexible canvas tubing ("Ventube").

VANO DESIGN "C"

VENTILATOR-EXHAUSTER

Vano Design "C" equipped with 8" discharge tubing removing welding fumes.

Vano Design "C" equipped with two suction lines removing welding fumes for operators' safety.

For withdrawing welding fumes from confined places or directly from the welding rod ...or for expelling fumes or hot air from enclosed vessels. You can get it with 8" suction inlet for 8" non-collapsible tubing ...or with multiple inlet nozzles for 5", 4" or 3" suction hose. The discharge outlet takes 8" "Ventube". Powered by a ½ hp motor, it weighs only 85 lbs.

COPPUS ENGINEERING CORP., 205 PARK AVENUE, WORCESTER 2, MASS.
Please send information on the Blowers that clear the air for Action.

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fuselages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.

NAME.....

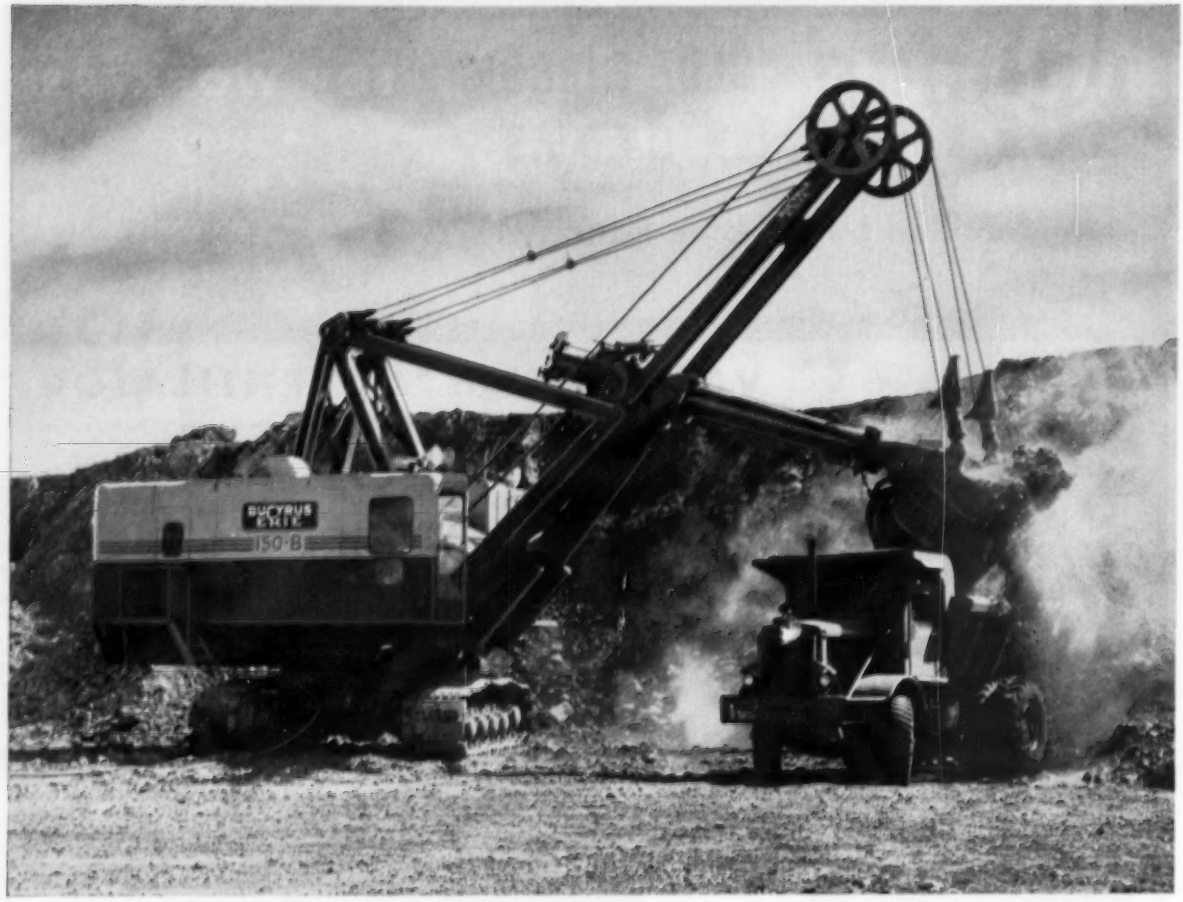
COMPANY.....

ADDRESS.....

CITY.....

(Write here any special ventilating problem you may have.)

COPPUS "BLUE RIBBON" PRODUCTS—*Designed for Your Industry, Engineered for You*



This Bucyrus-Erie 6-yd. 150-B is shown working in a California iron mine.

In California . . . and the World Over

Bucyrus-Erie Electric Shovels Help Keep a Ceiling on Mining Costs

Stripping stubborn overburden, loading abrasive iron ore—*any* tough mining job is taken in stride by Bucyrus-Erie electric shovels. Most important, they work with the dependability and economy necessary to keep a ceiling on mining costs.

The modern design that makes the outstanding performance of Bucyrus-Erie electric shovels possible begins at the front end with exclusive two-section boom. This design provides plenty of strength without excess weight, reduces wear on main machinery and speeds work cycles. Ward Leonard electric control provides fast acceleration and deceleration for high-speed coordinated operation. There is extra torque and ample power when it is needed most.

These and other important features combine to make Bucyrus-Erie electric shovels outstanding in their ability to put a ceiling on mining costs the world over. 146L57

BUCYRUS-ERIE COMPANY

SOUTH MILWAUKEE, WISCONSIN

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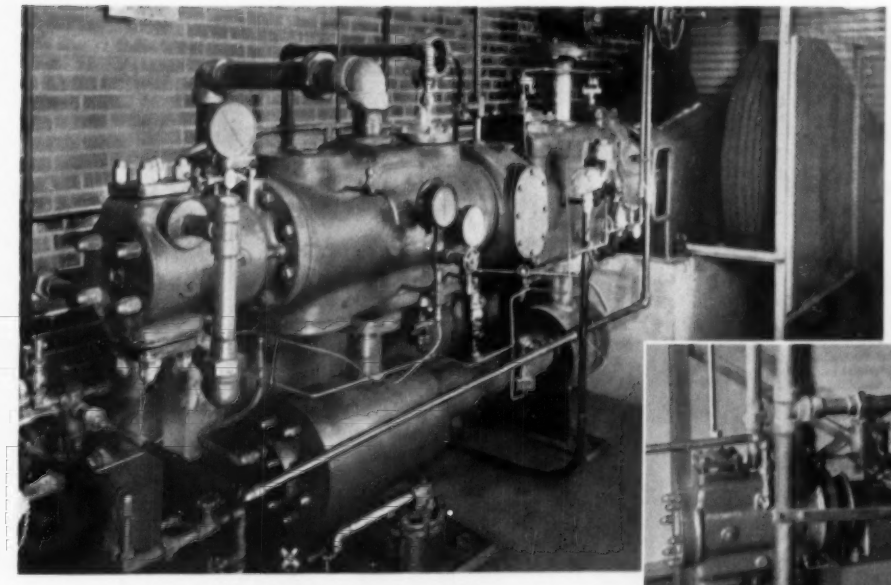
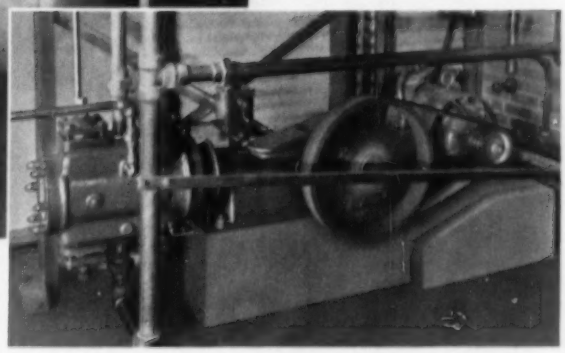


Hydrogen

The 3-stage ES at left compresses hydrogen to 1000 psi, for processing low-grade scrap into pure copper powder.

Natural Gas

This Ingersoll-Rand ER compressor is used as a natural gas booster in the reforming process which produces hydrogen for copper reclamation.



PURE POWDERED COPPER from LOW-GRADE SCRAP

IR compressors play leading role in new recovery method at Whitaker Metals Corporation

Junked motors, copper-clad iron scrap, auto radiators, sweepings and furnace ashes containing brass and copper turnings . . . low-grade scrap which never before could be economically reclaimed . . . all now yield pure powdered copper which is ideal for roll-bonding into rod, strip and tubing stock.

This is possible due to a technique developed by Chemetals Corporation (New York) and first put into operation at the North Kansas City plant of Whitaker Metals Corporation. The key to the process is hydrogen gas, compressed to 1000-psi pressure by an Ingersoll-Rand ES compressor. Whitaker manufactures its own hydrogen from natural gas, using a smaller I-R compressor as a gas booster unit.

These compressors have been operating for more than two years with only routine maintenance attention, and are another example of the dependability of Ingersoll-Rand equipment. This ability to stand up in continuous heavy-duty service means real long-range economy on any type of job. Ask your I-R representative for information on air or gas compressors suited to your specific needs.

ONLY I-R COMPRESSORS HAVE CHANNEL VALVES

Known for high efficiency, quiet operation and exceptional durability. Entirely different. Each valve is a combination of rigid stainless-steel channels and leaf springs, with trapped-air spaces which cushion action, prevent impact.

Ingersoll-Rand

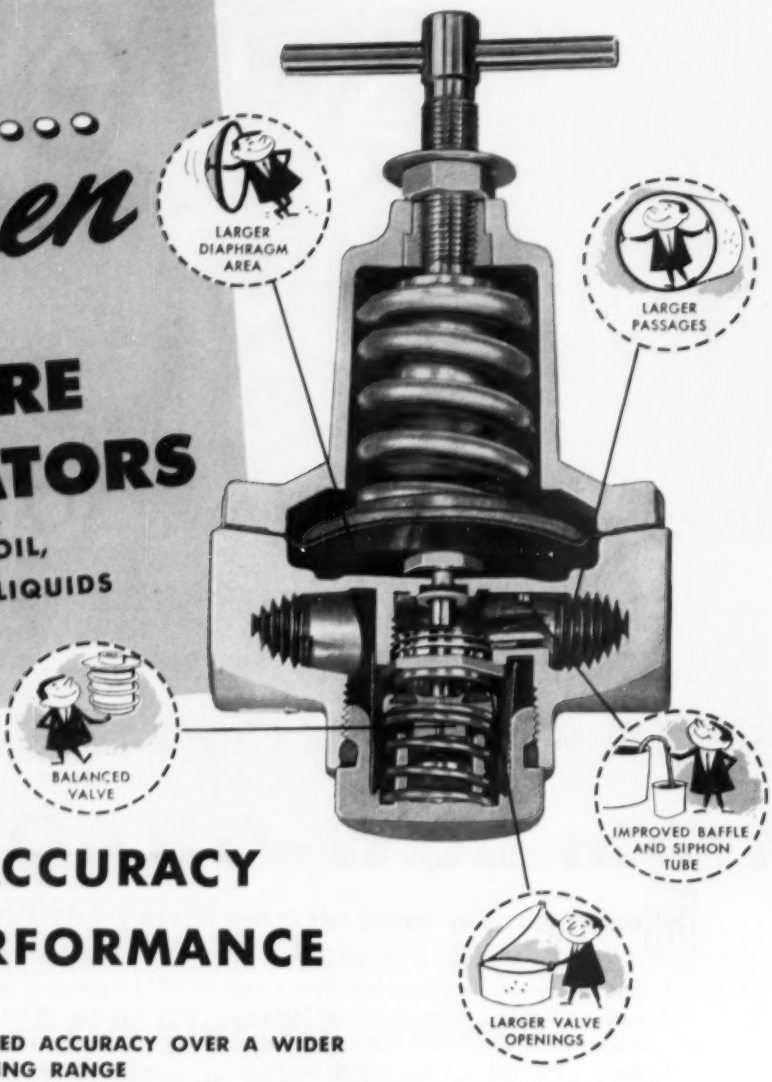
I-585

11 Broadway, New York 4, N.Y.

COMPRESSORS • GAS & DIESEL ENGINES
AIR & ELECTRIC TOOLS • CONDENSERS
VACUUM EQUIPMENT • ROCK DRILLS • PUMPS

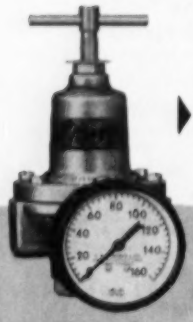
NEW... Norgren PRESSURE REGULATORS

FOR AIR, WATER, OIL, NON-CORROSIVE LIQUIDS AND GASES



GREATER ACCURACY
BETTER PERFORMANCE

- **IMPROVED ACCURACY OVER A WIDER OPERATING RANGE**
- **GREATER ACCURACY OF REGULATED PRESSURE** even with widely fluctuating line pressure and rapidly varying flow.
- **LARGER FLOW CAPACITY**
  - a. Balanced Valve Construction
  - b. Greater Effective Diaphragm Area
  - c. Improved Baffle and Siphon Performance
  - d. Larger Passages
  - e. Larger Valve Openings
- **RELIEVING AND NON-RELIEVING TYPES AVAILABLE FOR AIR**



For complete information on all your regulator needs, ⅛" to 2" inclusive, call your nearby Norgren Representative listed in your telephone directory — or WRITE FACTORY FOR LITERATURE.

C. A. NORGREN CO.

3407 SO. ELATI STREET • • • ENGLEWOOD, COLORADO

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PACKAGED AIR
Delivered Where You Want It

No matter how deep you go underground, you can take fresh air with you and get rid of stale air, gases and fumes through dependable Naylor Spiralweld pipe.

Over the years, contractors have come to recognize the advantages of Naylor over other lightweight pipe. In large diameter vent pipe, for example, the exclusive Naylor spiral lock permits the use of lighter gauge material without sacrifice of strength or safety — particularly in push-pull operations.

Along with this obvious economy, you save time and money by using the one-piece Naylor Wedgelock coupling for fast, positive connections — especially where only one side of the pipe is in the open.

Whether you need pipe for ventilating, air and water, hydraulicking, dredging or materials handling, it will pay you to look into this Naylor pipe and coupling combination.

Write for Bulletins 507, 513 and 514.

NAYLOR

NAYLOR PIPE COMPANY
1245 East 92nd Street, Chicago 19, Illinois

Eastern U.S. and Foreign Sales Office:
09 East 42nd Street, New York 17, N. Y.

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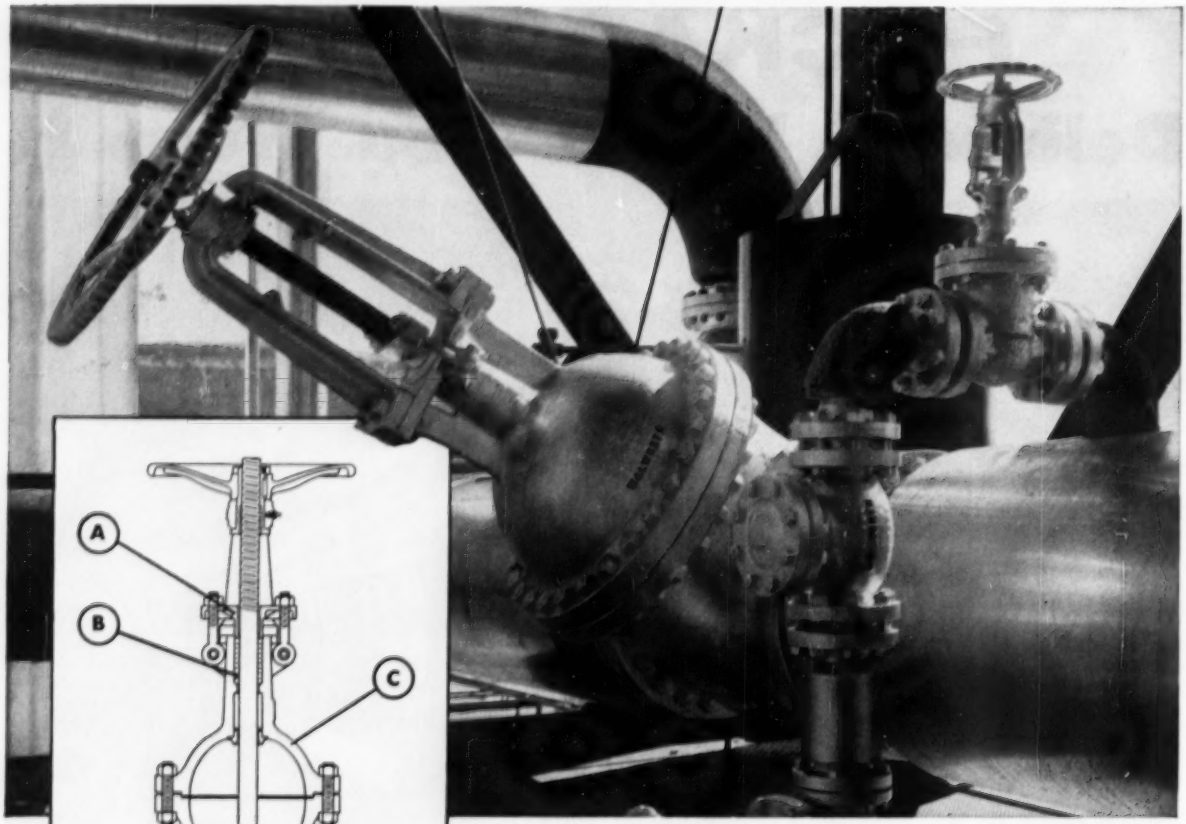

Walworth Series 150 and 300

CAST STEEL GATE VALVES OFFER YOU THESE FEATURES

for 'round-the-plant service

(A) GLANDS: Clearances between the gland and stuffing box, and gland and stem, are such that the stem cannot be scored even if the gland is pulled down unevenly.

(B) DEEP STUFFING BOXES: More than adequate in all sizes (2″ to 24″) to assure tightness and maximum packing life.

(C) BONNETS AND BODIES: Engineered to exceed the requirements of all applicable codes and standards. They are tough, durable, dependable.

(D) INTEGRAL GUIDE RIB FACES IN BODY: Machined to insure accurate centering of the gate.

(E) STURDY SEAT RINGS: Bottom-seated so that no recess exists at the back of the ring to cause turbulence, erosion and pressure drop.

(F) STREAMLINED PORTS: Permit unobstructed flow which results in minimum pressure drop and reduces the possibility of erosion.

Walworth Cast Steel Gate Valves can be furnished with either flanged ends or butt welding ends. Roller bearing yokes are available on the larger sizes. On valves 4 inches and larger, by-passes can be furnished. Walworth Cast Steel Gate, Globe and Check Valves from Series 150 to 2500, are available. For Series 600 and higher, we recommend Walworth Pressure Seal Cast Steel Valves. See your Walworth Distributor or write to Walworth for complete information.

WALWORTH

60 East 42nd Street, New York 17, New York

SUBSIDIARIES: ALOYCO ALLOY STEEL PRODUCTS CO. CONOFLOW CORPORATION GROVE VALVE & REGULATOR CO. SW SOUTHWEST FABRICATING & WELDING CO., INC. MH M & H VALVE & FITTINGS CO. WALWORTH COMPANY OF CANADA, LTD.

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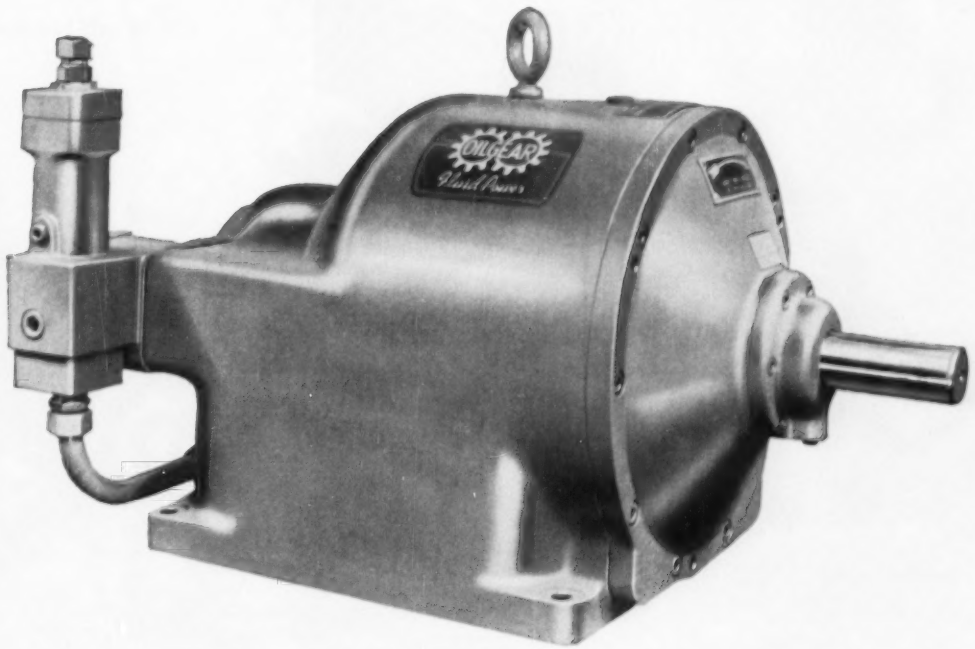


OILGEAR CONSTANT AND VARIABLE DELIVERY PUMPS. Sturdy, compact units built in sizes having normal ratings from 4 to 150 hp. For over 5 years, Cellulubes kept the durability of these pumps high, even on constant pressure applications.

Where a fire-resistant lubricant is a must—

Celanese Cellulubes give you the plus feature of excellent lubrication . . .

More and more equipment manufacturers and lubrication engineers are learning that fire-resistant Cellulube lubricants provide superior protection against excessive wear during continuous operation under extreme pressures. Tests conducted by The Oilgear Company of Milwaukee, Wisconsin on various fire-resistant fluids showed that Cellulubes "seem to be the most satisfactory fluids for use in Oilgear pumping equipment."

Cellulubes are straight phosphate ester base synthetic oils . . . chemical compounds that contain no additives. Because of this, and because of lower flammability and reduced tendency to form undesirable deposits, Cellulubes can provide excellent lubrication combined with dependable fire protection.

Cellulubes are available for supply in 6 controlled viscosities to meet exacting requirements in the replacement of flammable lubricants presently in use in your plant or equipment. Write for working samples and complete data for a thorough evaluation.

Celanese Corporation of America, Chemical Division, Dept.596-E, 180 Madison Avenue, New York 16, N. Y.

Celanese® Cellulube®

Celanese CHEMICALS

In Canada: Canadian Chemical Co., Limited, 2035 Guy Street, Montreal, P. Q., Canada
Export Sales: Amcel Co., Inc., and Pan Amcel Co., Inc., 180 Madison Avenue, New York 16, N. Y.

EXPLOSIVES RESEARCH PAYS OFF

The construction of modern highways utilizes many and varied engineering skills and techniques. One of these skills, the use of specialized explosives and blasting methods, helps to speed completion of these arteries so important to our economic development.

The efficient use of industrial explosives levels hills, fills valleys, drives tunnels, and straightens rights-of-way to make the highways of tomorrow wider and safer.

Hercules has pioneered in the development of improved explosives and blasting techniques for more than 40 years. Whatever your blasting problem may be, Hercules has the right explosives and technical representatives to help you do the job quickly, efficiently, economically. We'll welcome an opportunity to consult with you.

XRS7-5

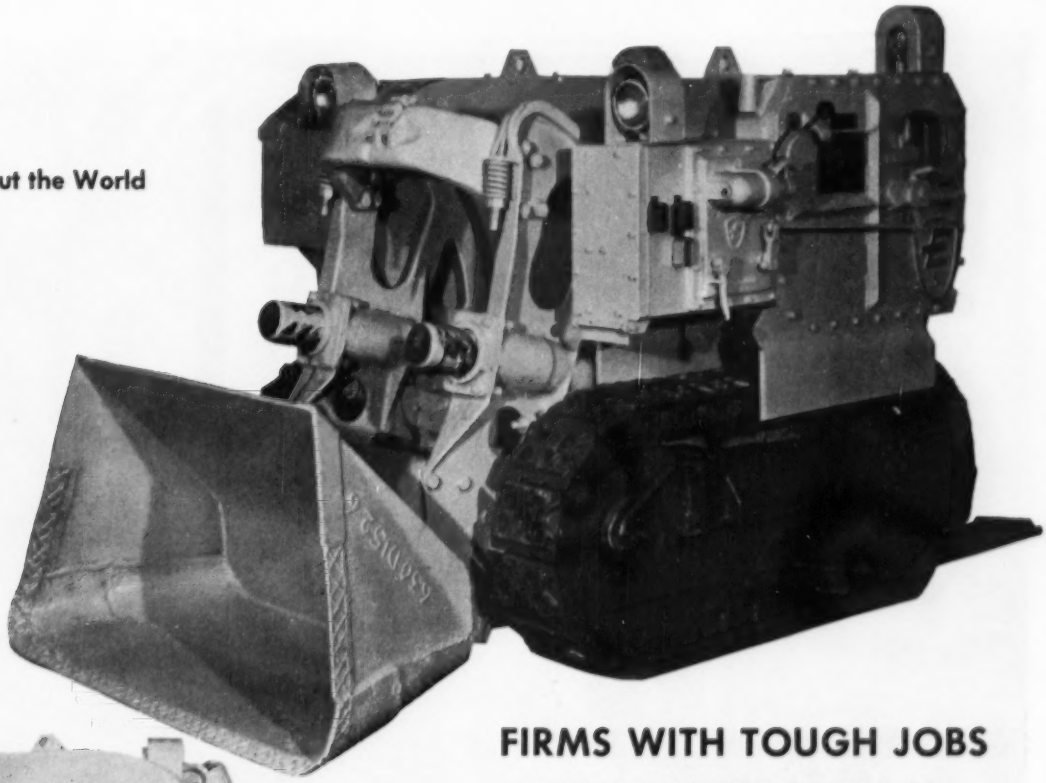
HERCULES POWDER COMPANY
INCORPORATED

Explosives Department, 932 King Street, Wilmington 99, Delaware

Branch Offices: Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Calif.; New York, N. Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Calif.

HERCULES

Throughout the World



FIRMS WITH TOUGH JOBS RELY ON EIMCO 630's

GERMANY . . . An air powered Eimco 630 Crawler-Excavator loads loose, sticky material into Zettlemeir dumpers — 60 meters below surface — at a 260 meter conduit project that will pipe water from a lake to a large city for culinary use. Tunnel drivers expected to blast solid rock; instead, they hit soft "molasses." **REPORT:** "The Eimco handles this entire excavating chore on a 22% up-grade with ease . . . operates perfect."

GREAT BRITAIN . . . An electric-powered Eimco 630 mucks three shifts a day with its tracks submerged to the center of the front idlers in an "underground stream." Holes burned in the bucket for drainage, cascade water onto the electric motors. An electric rail mounted loader of another make was abandoned after a few months' service due to excessive downtime. **REPORT:** "The Eimco stays on the job. Mine personnel are amazed at its performance under such adverse conditions."

EASTERN U.S. . . . High in the Appalachian Mountains an Electric 630 mucks short crosscuts, cuts slopes under pillars, robs pillars, mucks high grade ore from confined areas where maneuverability and overhead discharge are essential to profitable extraction . . . and does many other tasks. **REPORT:** Quoting the mine superintendent: "Every mine should have at least one Eimco 630."

In all parts of the world, you'll find firms with tough mucking jobs relying on Eimco 630's. **FIND OUT WHY . . . BEFORE YOU BUY!**

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Pittsburgh, Pa. Seattle, Wash.
Cleveland, Ohio Houston, Tex. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

EIMCO

B-255

Wagon drills, equipped with Bethlehem Hollow, in use on Connecticut Turnpike. Contractor: The Savin Construction Corporation.

Moving 570,000 cu yd of rock for section of Connecticut Turnpike

Wagon drills equipped with Bethlehem Hollow Drill Steel were used in force recently to speed the removal of 570,000 cu yd of medium-hard rock, so that construction of nearly nine miles of the Connecticut Turnpike could get underway in the Norwalk area.

On this portion of the 129-mile toll road, which is to extend from Greenwich, near the New York line, to Killingly, at the Rhode Island boundary, Bethlehem Hollow Drill was used in 1¼-in. rounds and hexagons, fitted with carbide-insert bits. It gave excellent performance in making blast holes from 8 ft to 26 ft deep.

Whether it's a road project or some other type of rock removal, you can't go wrong with Bethlehem Hollow. This is because it is rolled from fatigue-resistant steel. Bethlehem Hollow has a uniform hole, centrally located in the bar. It also has a wide quenching range. It is easy to heat-treat for the proper balance of toughness and wear-resistance, resulting in long-wearing threads and strong shanks.

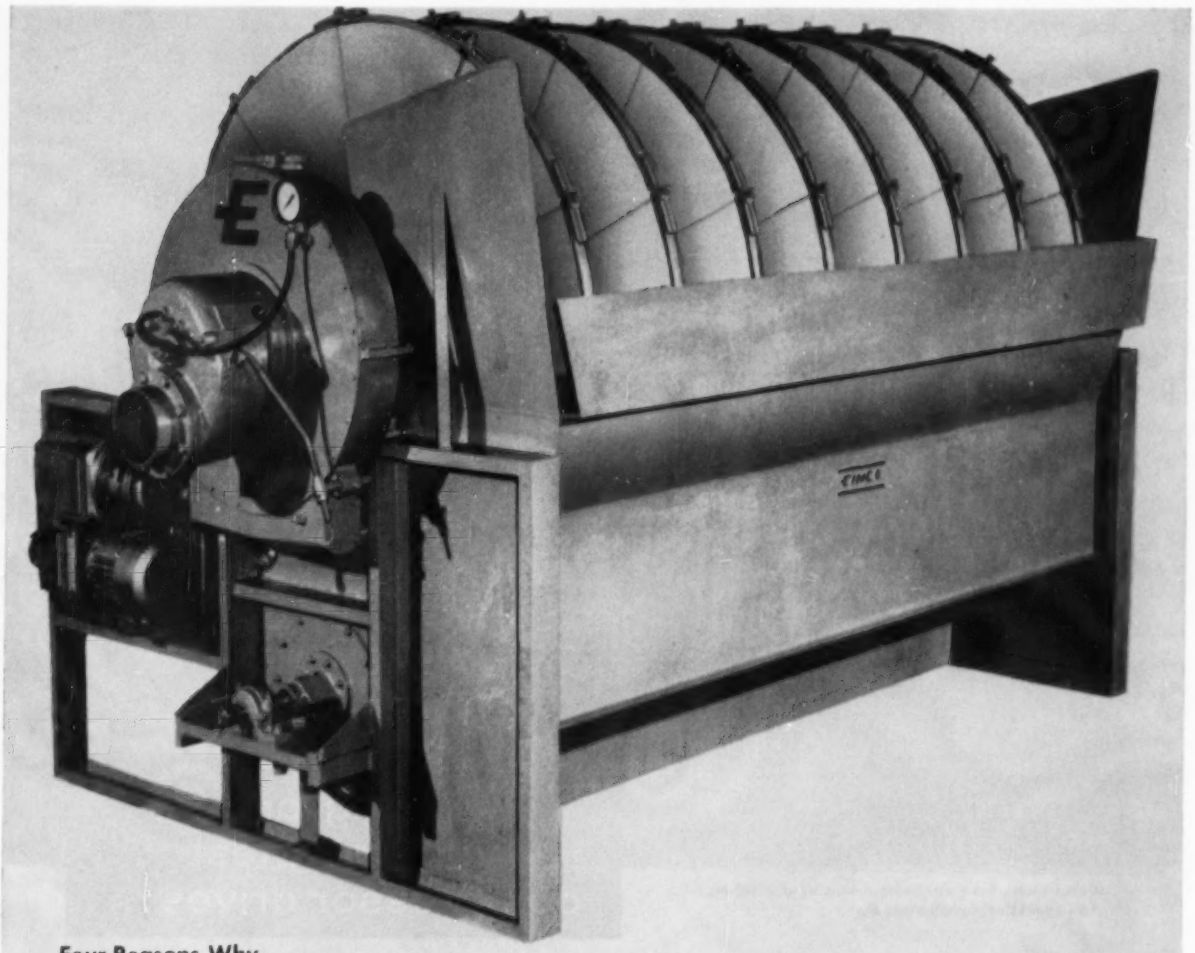
Bethlehem Hollow comes in Carbon and Ultra-Alloy grades in rounds, hexagons and quarter-octagons. It is regularly furnished in lengths of from 18 ft to 27 ft, although longer lengths can also be supplied.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM HOLLOW DRILL STEEL CARBON AND ULTRA-ALLOY

BETHLEHEM STEEL



Four Reasons Why

EIMCO AGIDISCS SUCCESSFULLY FILTER TACONITE

Eimco Agidisc Filters — now employed by **the** large Taconite producers for the crucial filtration step that immediately precedes pelletizing in the Taconite Flow Sheet—are used because they get these four results vital to a trouble-free, economic operation: (1) **Close Moisture Control**; (2) **High Capacity**; (3) **Good Cake Discharge**; (4) **Low Unit Cost.**

(1) **CLOSE MOISTURE CONTROL:** Eimco Agidisc Filters send cake to the balling drums having a moisture content **within critical limits** (usually 10.2 to 10.5%) necessary for efficient, uniform pellitizing.

(2) **HIGH CAPACITY:** Eimco Agidisc Filters with **Hy-Flow** design permit high filtration rates (450 to 600 dry pounds per hour per square foot) for Taconite slurries usually about 60% solids at 80 to 85% minus 325 mesh grind.

(3) **GOOD CAKE DISCHARGE:** The Eimco Agidisc combines disc-type continuous filtration with properly directed agitation to produce a homogeneous cake, easily discharged from disc sectors. Eimco **Snap Blow** removes cake from filter medium . . . eliminates need for scrapers.

(4) **LOW UNIT INVESTMENT:** Eimco Agidiscs get more production per $ of investment, maintenance and operating costs. Close attention to detail and superior disc design, provides more square feet of filter area in less floor space. Media changing downtime is negligible. Process control and maintenance is simplified.

Eimco Clients, Eimco Field Engineers and Eimco Research and Development Technologists, have accumulated valuable data on such things as practical filtration methods . . . factors affecting moisture content . . . vacuum displacement . . and filter medium; data that now makes it possible to accurately predict filtration rates for a wide variety of conditions. **Let this experience and know-how go to work for you!**

THE EIMCO CORPORATION

SALT LAKE CITY, UTAH

Research and Development Division, Palatine, Illinois • Process Engineers Inc. Division, San Mateo, California
Export Offices: Eimco Building, 51-52 South Street, New York 5, N. Y.
BRANCHES AND DEALERS IN PRINCIPAL CITIES THROUGHOUT THE WORLD

B-258

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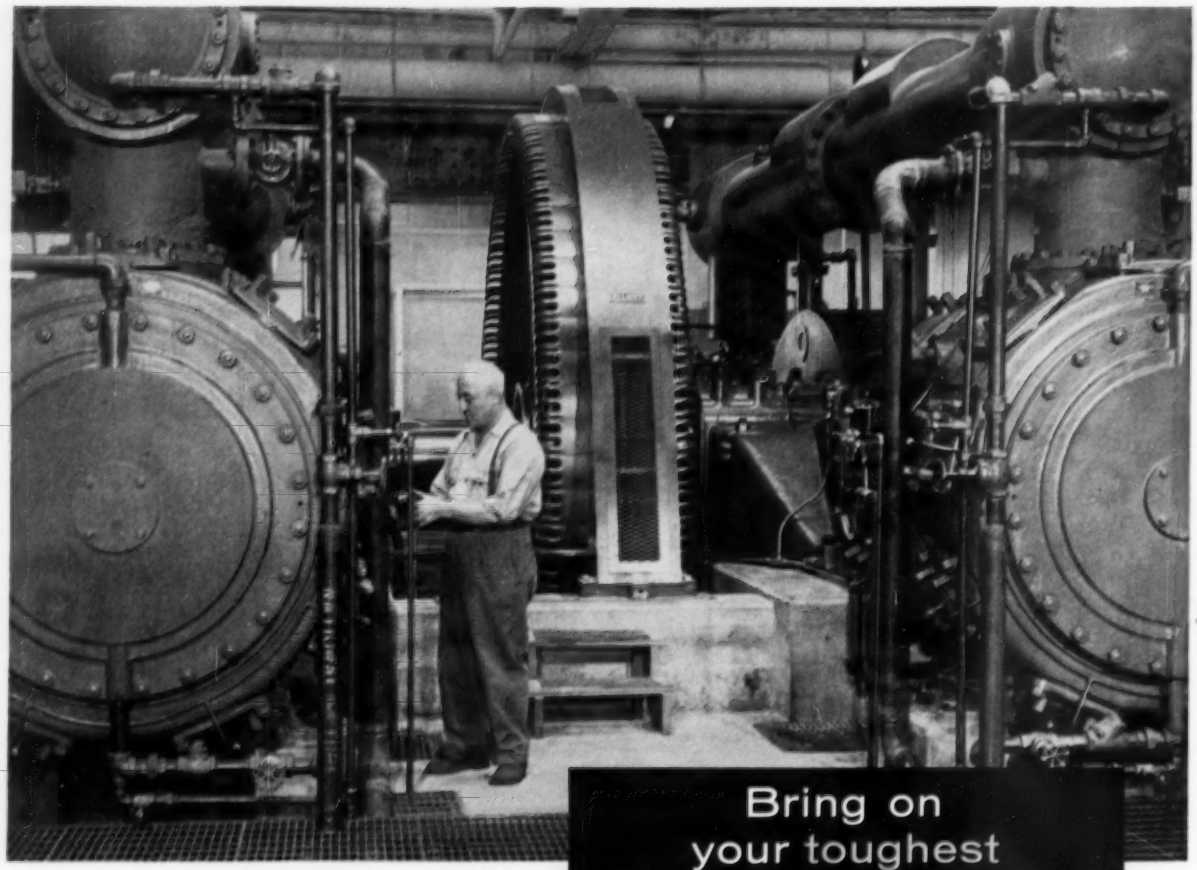

Compressors here are being driven by a 2000-hp, 164-rpm Elliott Synchronous Motor.

Bring on your toughest compressor drives...

ELLIOTT synchronous motors take 'em in stride

This giant-sized stator for another Elliott Motor is ready to go!

That's what they're built for—the toughest jobs anywhere. And in successful installations all over the country, Elliott motors, like the one above driving compressors in an automobile manufacturing plant, have demonstrated superior performance.

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ON THE COVER

IN MEXICO and Guatemala the mountains have jawbreaking names and their steepness tries the souls of men. As a popular song has it, "you've got to have heart" to build roads there. Our cover picture shows a particularly precipitous bit of terrain on the Inter-American Highway in Guatemala.

IN THIS ISSUE

BY BONDING enamel to a light metal base, decorative tiles can be produced that have the beauty and durability of ceramic tiles without the burdensome weight. Our leading article tells how Vikon metal-base tiles of various types are made.

•

WHEN Wilson Dam was built on the Tennessee River at Muscle Shoals, Ala., no one could foresee the phenomenal increase in river-borne traffic that was to come. As a result, the locks provided there are now inadequate and a $35-million construction program is under way to correct the situation. Included is a new lock that will lift or lower boats a record 100 feet in a single stage. Page 133.

•

AT LOS ANGELES, Calif., Union Oil Company is erecting a $30-million headquarters that will provide office space for itself and others. Included are such modern features as a 3-deck underground garage. The steel skeleton of the main building was fabricated with high-tension steel bolts applied with uniform tightness by means of torque control Impactools. Page 138.

•

MOTORISTS who are waiting to drive through Central America and on south are referred to the article on pages 142-43. Supplementing our cover picture, it conveys a vivid impression of the obstacles that face the contractors striving to close the last remaining highway gaps.

HONORED

THE NATIONAL Federation of Press Women has awarded Mrs. Amy Passmore Hurt, of Albuquerque, N. M., third place in the trade journal feature category for her article *They Built It on a Mound of Earth*, which we published last September. The article had previously won a first-place award for Mrs. Hurt in her home state. It described the construction of Albuquerque's new civic auditorium.

CORRECTION

THE CAPTION of a picture on page 79 of our March issue showing the first use of pneumatic tools in the Barre, Vt., granite quarries stated that Smith's Upper Quarry, where the tools were demonstrated, is now a part of Reynolds & Son., Inc. Actually, the property belongs to Rock of Ages Corporation.

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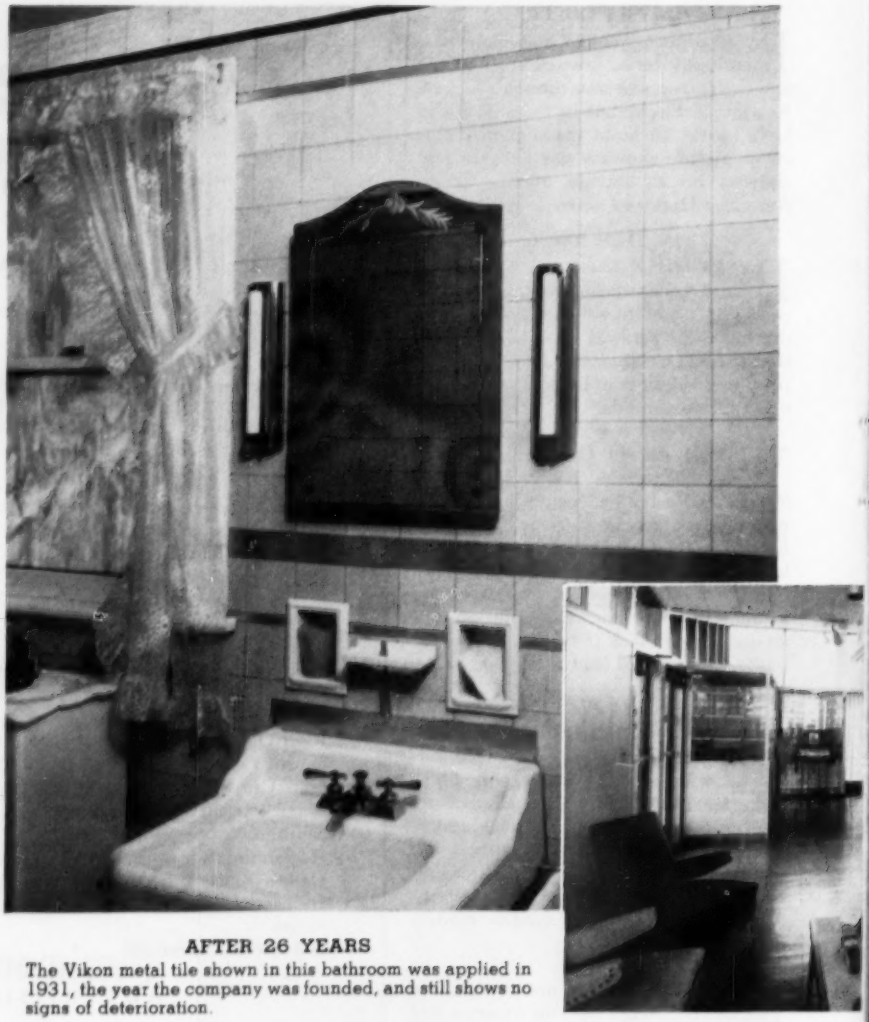
Vikon Enameled Metal Tile

Porcelain and Synthetic Resin Coatings Bonded to Light Base Produce Durable and Attractive Building Material

JAMES STAPLES



AFTER 26 YEARS

The Vikon metal tile shown in this bathroom was applied in 1931, the year the company was founded, and still shows no signs of deterioration.

CERAMICS have been used for centuries in building construction and decoration, but only during recent years has a ceramic been bonded to thin sheets of aluminum to create a flexible wall tile. Porcelain-on-aluminum is one of five types of metal tiles introduced by the Vikon Tile Corporation, of Washington, N. J., and its predecessor firms.

The original concern was organized in Brooklyn, N. Y., as the Sanitary Tile Company by inventor Rudolph Herceg, and in 1926 produced the first steel tile on which synthetic resin enamel had been baked. Herceg died in 1928, but operations were continued and in 1931 the enterprise was incorporated as the Sanimetal Tile Corporation. The sales manager later bought the assets and in 1941 moved the business to Washington. In January 1946, it was bought by two brothers, Charles and Harold Jensen.

Progress came with the Jensens. They reincorporated under New Jersey law and gave the firm its present name. This is a progression of the word "Viking," which was understandably liked by the brothers, who are of Scandinavian descent. Viking couldn't be copyrighted, but Vikon could. First they found out how to apply to aluminum tiles the same enamel that was being used on steel and later they introduced plain stainless steel and clear-enameled copper tiles. Today Vikon is the largest of some half dozen American metal tile makers. The original enameled steel tile is the largest seller, followed by the enamel-on-aluminum type.

The use of metal tile on both exterior and interior walls is growing steadily. It is liked by "do-it-yourself" builders and renovators because it is easy to apply. The most popular home use of tile is in bathrooms, kitchens and playrooms. Some architects are using stainless steel tile effectively as a weatherproof and highly decorative exterior wall surfacing and trim. A good example is found at the entrance to the office building at the Vikon plant.

Metal tile is considerably lighter than the solid ceramic variety and hence imposes less load on the supporting structures of buildings in which it is used. An average 6x8-foot bathroom can be finished with 97 pounds of Vikon metal tile. Another advantage is that the tile can be trimmed as needed to fit snugly around fixtures or bent to cover curved surfaces.

The manufacture of metal tile is basically the same regardless of the type of metal involved, but with a few additional or different steps. Vikon buys carbon steel, aluminum, copper and brass in rolls and stainless steel in sheets. Blanks of the intended size are stamped out, two at a time, by punch presses and stacked in wheel-mounted magazines awaiting further processing. The blanks are beveled at the edges, the standard tile having a cavity 0.060 inch deep.

Carbon steel is received already coated with zinc and then iron phosphate. It is given a chromatizing treatment at Vikon and receives a quick-drying primer coat just before it is sprayed with enamel. Stainless steel (8-percent nickel and 18-percent chrome alloy) is received grained by a polisher and coated with protective adhesive paper. The paper stays on during the stamping process and is not removed until the tile is to be applied to a wall. Stainless steel requires no protective chemical treatment or enameling. Copper and brass also are polished prior to their receipt. The polishing produces a grain that is attractive and it reduces excessive glare when the tiles are in service. To inhibit oxidation, Vikon applies reagents to the surface of copper and brass tiles before enameling.

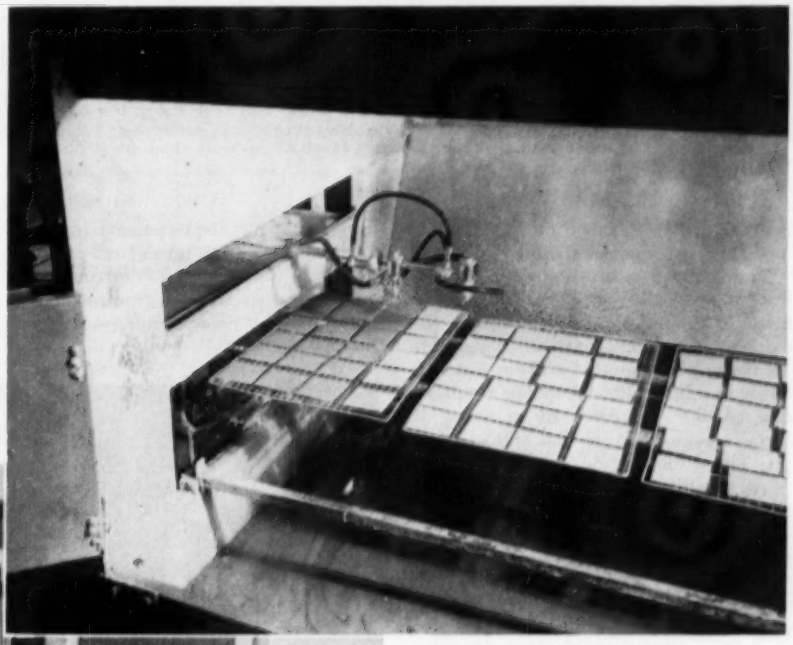
Soon after aluminum arrives in the plant it is given an Alodizing treatment to curb oxidation. This process was developed by The American Chemical

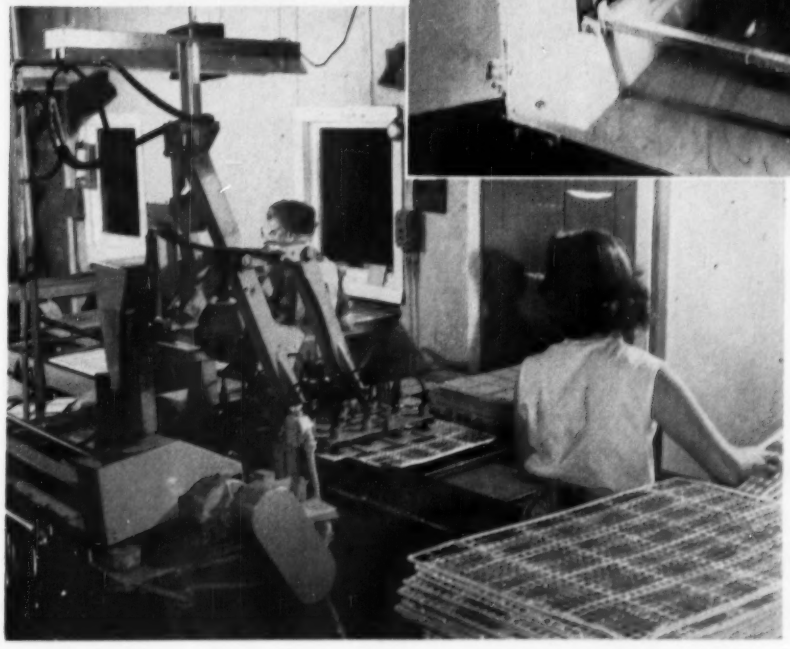
Paint Company of Ambler, Pa. The metal, 9 inches wide and 0.020 inch thick, and in 400-pound rolls containing 250 feet, passes successively through five tanks at a rate of 30 feet per minute, being pulled by power rolls at the finish end of the equipment. There are squeeze rolls between tanks. First it is cleaned in an acid spray bath. After excess acid has been removed by a water spray, the metal is given a spray of Alodine solution, which consists of salts of chromic and phosphoric acids dissolved in hydrofluoric acid. This leaves it with a phosphate coating. It is then sprayed with water, followed by a neutralizer and dried by passing it between manifolds having slits in them from which hot compressed air issues and blows the moisture off. The air receives its heat from the work that is done on it during compression. The dried strip is then recoiled to prevent oxidation.

The biggest achievement of the Jensens to date was the development of the process for bonding ceramic to aluminum. This is done by spraying both sides of the metal blanks with porcelain and then firing them at 980°F. If only one side were to be coated, the tiles would warp from the heat and lack the desired rigidity. Blanks to be sprayed with the porcelain coating are transferred from a magazine containing 24 stacks weighing 1000 pounds. Twenty-four rubber vacuum cups spaced on a square pattern matching that of the stacks in the magazine, pick the top blank from each stack and all 24 are swung over to a conveyor belt and there deposited, still in the same pattern, on a square screen carrier by releasing the vacuum. As the top blanks are removed from the stacks, the latter are automatically lifted a distance equal to the thickness of a blank. Thus the top members are always at the same height when the vacuum cups descend. The blanks, with their backs up, are carried by the conveyor into the first of two spray booths and a 0.002-inch coating of enamel is applied by a single spray gun. The blanks are then turned over and conveyed to a second booth where a 0.003-inch film of enamel is sprayed on their faces by four guns which are set at slight angles so as to insure covering the beveled edges of the tiles. The guns move in a horizontal plane so as to cover all tiles evenly and the enamel is applied as a series of thin coats rather than one heavy one. The enamel is then dried in a chromolex unit and the tiles are conveyed through an electric

FACTORY SHOW ROOM

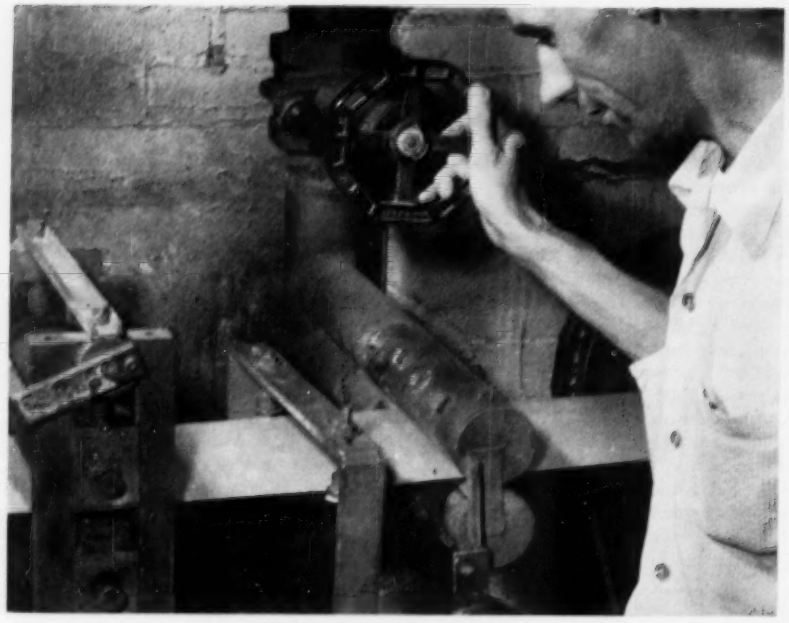
Vari-colored tiles of different designs are displayed in modernistic fashion in the visitors' waiting room at the factory in Washington, N. J.





SUCTION-PRESSURE TEAM

Suction cups on the machine at the left are about to release 24 metal tile blanks they have picked up from a magazine in the left foreground. The screen on which they will be deposited is on a conveyor that will carry the blanks to a spray booth to be coated with enamel by air-operated spray guns (above).



AIR SQUEEGEE

Aluminum strip emerging from the final tank in the Alodizing-bath sequence is dried here. As it passes between an upper and lower manifold, hot compressed air issues from slits to blow any adhering moisture from both surfaces and then dry them. The air is heated without cost as a result of the work done on it during its compression.

furnace, at 980°F, for firing. After cooling, they are inspected and packed.

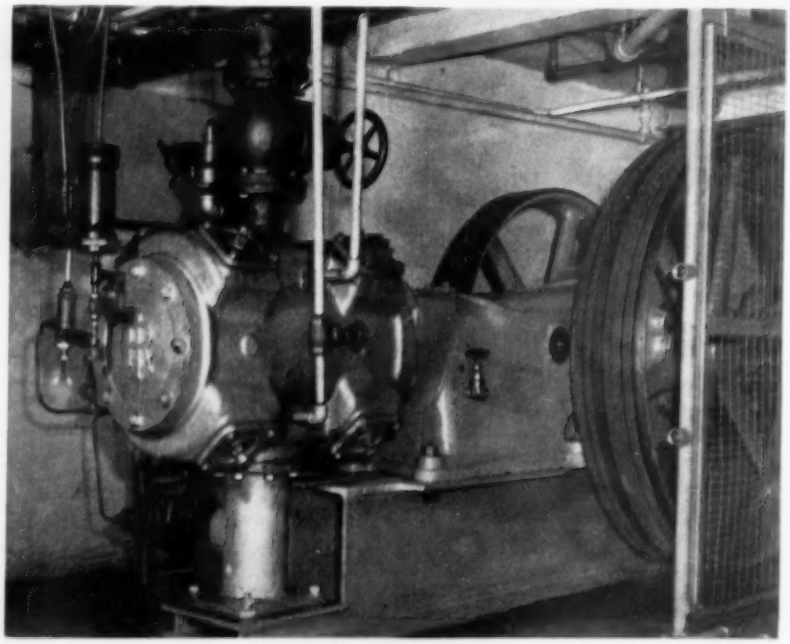
The enamel was developed by Du Pont and is of the vitreous type. It is made of ground glass flux, titanium dioxide and coloring oxides. These ingredients are ground for from 6 to 10 hours in a ball mill. When the resulting fine powder is suspended in water it forms a smooth liquid that sprays evenly. The same coating is now being applied to aluminum cooking utensils by the Club Aluminum Products Company, of Chicago, Ill. When sprayed on the aluminum surface, it enters the myriads of microscopic pockets formed by the Alodizing. At the firing temperature of 980°F, the aluminum softens and the porcelain is fused to it. Upon cooling, the two harden and are permanently bonded. A hammer blow dents the tiles but doesn't chip the porcelain.

Synthetic resin enamels are sprayed on aluminum, mild steel or copper in a manner generally similar to that described for porcelain-on-aluminum tiles and are cured by baking at 300°F for 15 minutes. The material used on copper tiles is transparent. Only stainless steel tiles are uncoated.

Compressed air for operating the spray guns is taken from the plant distribution lines, which are supplied by an Ingersoll-Rand Class ER single-stage compressor. Charles Jensen calls compressed air "the heart of our manufacturing procedure." In addition to atomizing the spray liquids, air moves it to the guns from tanks by displacement, transfers bulk enamels and thinners from one container to another in the mixing room and blows dust and dirt from machines, especially the presses that stamp out the tile blanks.

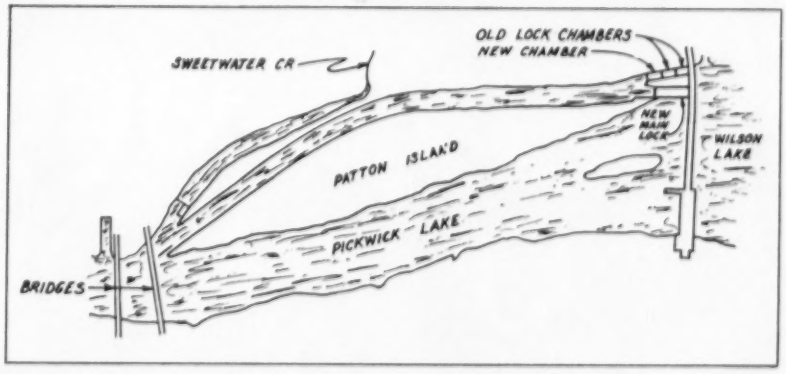
Standard Vikon tiles are made in squares of 4¼, 6 and 8½ inches and oblongs of 4¼x8½ inches, besides trim and molding strips. Coated tiles are available in any one of 26 standard colors as well as in multi-colored decorative designs imprinted by the silk-screen transfer process. They are either marketed through wholesalers or sold directly to dealer-contractor customers. Foreign sales are handled by an export agent in New York. Distribution has widened during the past decade to include many sections of the globe. Mastics, sold by Vikon, are suitable for mounting all types of tiles. An experienced man can set from 60 to 100 square feet of metal tile in a day. The company states that hobbyists can do a satisfactory job if they are careful. The walls must be smooth, dry, clean and not too porous. Those composed of plaster, plaster-board or ⅜-inch plywood are called the most acceptable, if suitably studded, nailed and sealed.

It is worthy of note that the Jensen brothers have made a success of Vikon Tile Corporation after starting out in totally unrelated fields. Charles, the firm's president, was previously director of personnel in a steel mill and later, in an aircraft engine plant. He had been a teacher and was head of the commercial department of a Chester, Pa., high school when they took over the concern. Harold, vice president and treasurer, previously made and sold ice cream in Washington with their late father, James Jensen. Both brothers were born within a few miles of the Vikon plant.



AIR SUPPLY SOURCE

This Ingersoll-Rand compressor furnishes air for the spray guns, for transferring liquid enamels, thinners, etc., for cleaning machinery and other services.



FLORENCE CANAL AND WILSON DAM

The dotted lines in the picture above show the new, straighter course the canal will take at the lower end to avoid the S-turn into the river. It will also be deepened 10 feet to eliminate the lock at that end. At the upper end of the canal, a new single-lift lock will be built next to the existing double-lift lock, as shown in the sketch at the left.

New Lock at Wilson Dam

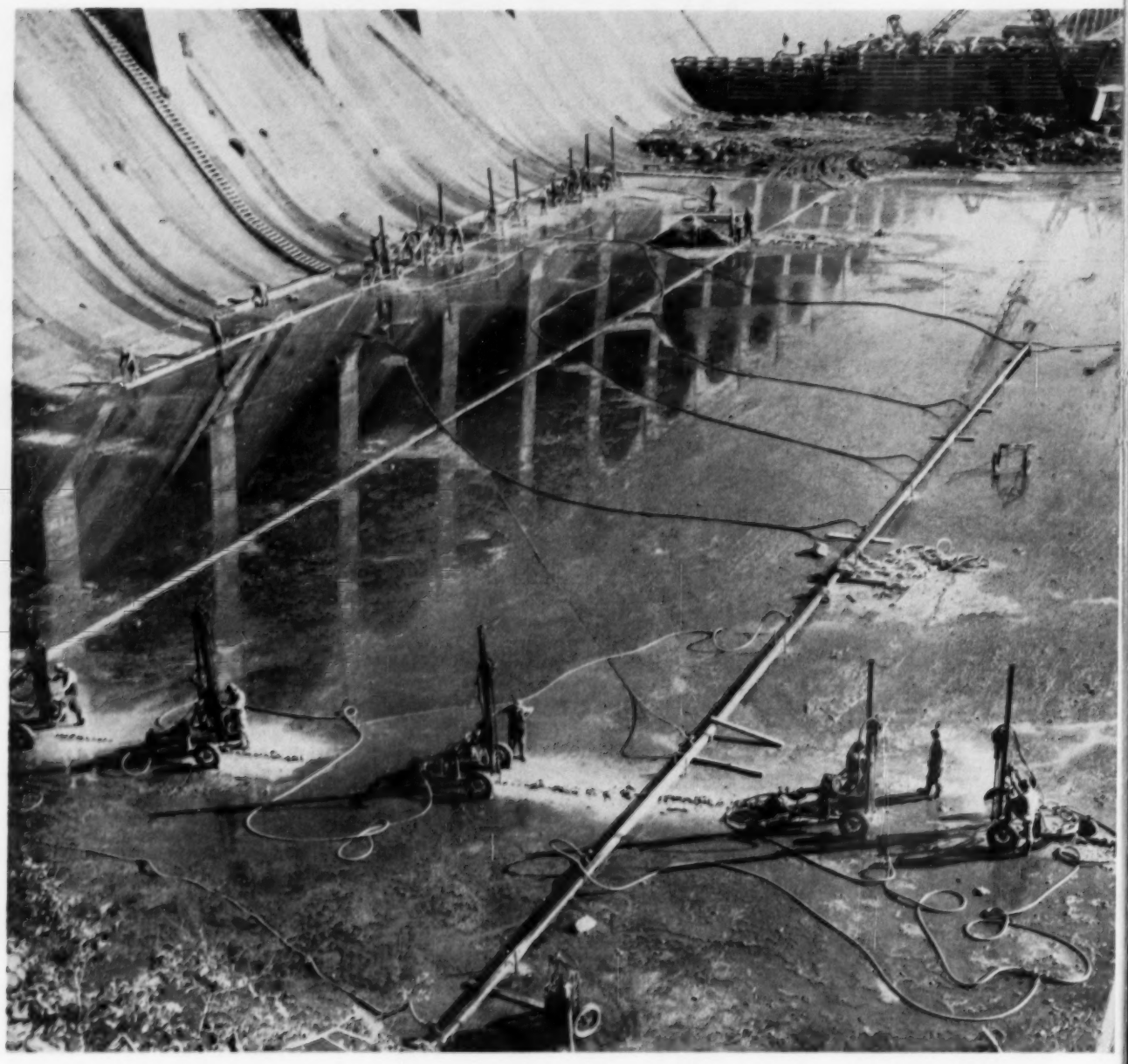
TVA Moves to Eliminate Traffic Bottleneck on Tennessee River

R. W. SAPORA

BETWEEN 1933 and 1945, the Tennessee Valley Authority succeeded in providing a 9-foot-minimum-depth navigable channel on the Tennessee River between Knoxville, Tenn., and the Ohio River—a distance of 630 miles. When the task was begun, there were in existence one lock each at Widows Bar and Hales Bar, and three locks at Wilson Dam. The present 9-foot minimum depth was made possible by the construction of seven additional dams and locks along the main river.

In the years that followed the establishment of the deeper channel, there was a rapid increase in river traffic. The tonnage is about twelve times as great as it was in 1933 and the ton-mileage 60 times. Naturally, this gain in goods shipped on the river brought about problems. At Wilson Dam, near Muscle Shoals, Ala., for instance, the traffic during 1955 totaled 2,210,000 tons, and it is estimated that by 1958 the capacity of the Wilson locks will be taxed to the utmost. Historically, the main obstacle to navigation along the Tennessee has been the rapids at Muscle Shoals, where the river drops almost 100 feet in a few miles, and it is ironic that the most serious bottleneck to river traffic should once again develop at this location.

Downstream from Wilson Dam, the locks at both Pickwick Landing and Kentucky dams have chambers measuring 110 feet wide by 600 feet long. On the other hand, Wilson locks, finished at the close of World War I, are considerably smaller. Here there is a double-lift lock at the north end of the dam with a combined lift capacity of 90 feet. The upper chamber has a clear area of 60x300 feet, and the lower chamber of 60x292 feet. Traffic is discharged downstream from these locks into the Florence Canal, which follows the north shore of the river for approximately 2½ miles, and is separated from the river by Patton Island. At the lower end of the canal, almost at the tip of this island, is the third of three Wilson Dam locks, having a lift of 10 feet and a clear chamber of 60x298 feet.



To pass Wilson Dam, therefore, river traffic must clear three locks and the Florence Canal. A typical tow of three oil barges and tow boat, about 528 feet long, takes 40 minutes to pass the locks at Pickwick Landing or Kentucky dams and six times as long to pass the locks at Wilson. The result is frequent "stacking up" of barges with long periods of delay.

The deficiencies of the present locks can be summarized as follows:

1. Three lockages are required.
2. Lock chambers are small and do not conform with standard barge sizes.
3. Excessive maneuvering of tows is required when entering and leaving the locks. A land projection on the north bank of Wilson Reservoir makes exit from the upstream lock difficult; the alignment of the lock at the end of Patton Island makes passage under the two bridges just below the island hazardous.
4. Limitations of the filling and emptying system result in slow operation and turbulence in the lock chambers.
5. The lock at the lower end of Florence Canal is frequently put out of service by floods.
6. Freeboard of the lock walls is inadequate.
7. Use of the lock interrupts traffic on the highway that crosses the dam because a section of the bridge must be lifted.
8. A large force is required to operate the three locks, two of which are separated from the third by a distance of almost 3 miles. This results in excessive operating costs. (The locks are operated by The Corps of Engineers, U. S. Army.)

To alleviate these conditions, Congress authorized an appropriation in 1955 for the design of a new lock and appurtenant structures at Wilson Dam and another one in July 1956, for the construction. Work began immediately and the new lock is expected to be completed in 1959, at a cost of approximately $35,000,000.

In addition to the new lock, the plan for Wilson navigation improvements includes a new canal, an auxiliary lock chamber and a new highway bridge over the main and auxiliary lock chambers. Work has already begun on the first two

EXCAVATING FOR NEW LOCK

Wagon drills are shown (upper left) line drilling at the base of the dam and at the near side as excavation of 400,000 cubic yards of rock began. A Naylor-pipe distribution main carries compressed air into the area, with hose takeoffs running to the drills. A cofferdam at the upper right keeps the river out. Two drills are shown just above at close range. The existing lock is behind the high ground at the left. The over-all view at the upper right shows broken rock being loaded for hauling out of one section of the lock area. The tower at the right center marks an Ingersoll-Rand Calyx drill that takes out 36-inch rock cores, thus figuratively enabling geologists to look underground.

of these projects; construction of the auxiliary lock and the highway bridge will be started later.

One of the purposes of the new structure is to eliminate the 10-foot-lift lock at the downstream end of Florence Canal. To make this possible, it will be necessary to deepen the canal by 10 feet. Previous dredging experience in the existing canal has provided valuable information about the underlying rock structure. It is estimated that the deepening operation will require the removal of approximately 900,000 cubic yards of rock and an additional 2,500,000 cubic yards of overburden. To enable this work to be done in the dry, a temporary canal will be excavated through Patton Island, by-passing that portion of the canal which will continue in use after the lock project is completed. Most of the excavation will be placed on an existing dike which protects the canal from high-water flow of the Tennessee River.

Tows emerging from the lower end of the present canal must make a time-consuming and dangerous S-turn and then pass under two bridges. The new canal will be constructed in such a way as to practically straighten this passage. In addition, consideration is being given to the possibility of depositing some of the material to be excavated at the downstream end of the island. It is believed that this will minimize difficulties encountered from eddies de-

A great deal of planning and research have gone into the design of the filling and emptying systems to be used in the lock. To fill it in a reasonable length of time, an inflow of about 20,000 cubic feet per second (cfs) will be required. The existence of Wilson Dam prevents the use of the conventional type of large, submerged inlet ports in the face of the lock wall upstream from the upper gate sill. Of the various plans considered, the approved one requires the construction of culverts directly through the existing spillway section of the dam to an inlet area on the upstream face. These culverts, on the upstream end, will be 15 feet wide and 23 feet high, reducing to 15 feet square. Trash racks will be provided at the entrances. The culverts will introduce about 10,000 cfs each into the land and river walls of the lock.

For the construction of these culverts, special cofferdamming will be needed. Plans are to use a box-type bulkhead which will be sunk to the proper depth, sealed against the upstream face of the dam and then unwatered, thus providing the required working area in a minimum of space.

Final discharge into the lock will be through a bottom lateral system, with plans calling for six laterals, three connected to each wall culvert. (The original study used ten laterals but laboratory tests indicated that six improved the flow conditions.) Each lateral has an entrance that is 6 feet high by 9 feet wide, and twelve ports 3½ feet high by 1½ feet wide. Laboratory testing is still in progress to determine the best plan for locating ports, particularly with regard to those which are directly across from each other in adjacent laterals.

An alternate plan for filling the lock was considered in an attempt to avoid cofferdam complications. The new lock will replace the portion of the dam spillway occupied by gates 1 through 8. Therefore, the possibility of filling the lock through existing spillway gates was studied. The actual structure will replace gates 3 through 6, so that all or part of gates 1 and 2 could be used to fill the land wall culvert, and 7 and 8 to fill the river wall culvert.

A large scale model, constructed in TVA's testing laboratory, was used to determine the practicability of this plan. However in the first test, air entrainment was found to be so serious that the scheme had to be abandoned.

TURBULENCE IS PROBLEM

As previously mentioned, the river is higher than the canal immediately downstream from the lock, which complicates complete emptying of the lock into the river. Discharging water at a rate of 20,000 cfs into the canal would cause excessive turbulence and eddying, and it has therefore been decided that as much water as possible from both the land and river walls of the lock will empty directly into the river. Final emptying of the lock into the canal will be through culverts around the lower gate of the lock.

The high lift of the new lock led to the consideration of several plans for a downstream gate. A conventional miter-type straight-girder gate was finally selected and will be 117 feet high. This type is heavier than an arched-girder miter gate, but less expensive to build.

An alternate plan, considered practicable because of the high lift of the lock, involved the replacement of the top 37 feet of the downstream gate with a fixed wall of steel or concrete. However, it was found that extremely difficult problems would be encountered in sealing the upper part of the gate to the bottom of the fixed wall and in locating both wall and gate in such a manner as to permit suitable access to the gudgeon pin and anchorage bars.

A lift gate was also considered, principally because it would eliminate the need for by-pass culverts for the final emptying of the lock into the canal, and because it would permit the shortening of the main lock walls by 30 feet. Despite its advantages, this installation was not adopted because of excessive construction costs.

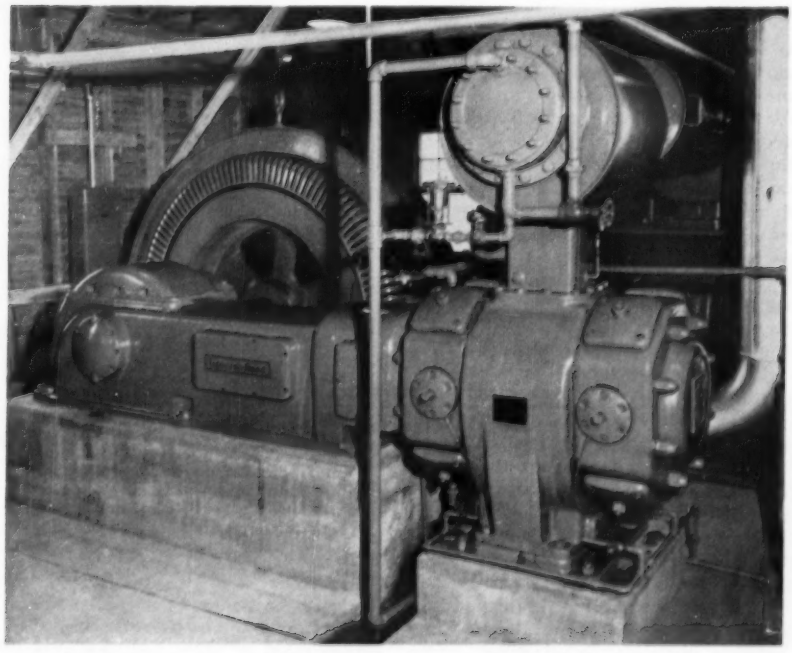
Three plans were considered for the main upstream gate—the conventional miter gate, a lift gate and a taintor gate. The lift type was chosen principally because this variety and its operating machinery would best fit into the over-all arrangement around the upper gate sill.

HIGH-LEVEL BRIDGE

A high-level bridge will be built to carry the highway that crosses the dam over the new and auxiliary locks and will permit the operation of the locks without interruption of traffic. It will rise from the present roadway approximately 2000 feet from the north shore at a grade not exceeding 5 percent. Where the new roadway rises several feet above the level of the spillway deck, modern, open-type, steel handrailing will be used. This will allow motorists to view the locks and Wilson Lake, which is not possible from the present roadway. Completion date is in 1959.

The auxiliary lock will be the last of the four major navigation improvements to be undertaken—being scheduled for completion in 1960. The existing two locks will be adapted for this purpose by building at their base a third chamber with a 10-foot lift. This will replace the 10-foot lock at the lower end of Patton Island. Tows from both the new lock and auxiliary will exit into the new canal.

The project manager at the new Wilson Dam Lock is Warren McMahan. The construction engineer is H. L. Broadfoot, and the construction superintendent is J. C. McCraw. The chief engineer for TVA is G. K. Leonard, chief construction engineer is H. T. Lofft, chief water control planning engineer, R. A. Elliot and chief design engineer, R. A. Monroe.



MAIN AIR SOURCE

This stationary compressor, augmented by several portable units, supplies air for rock drills and pneumatic tools used at the lock site.

veloping in that area, particularly in times of high water.

The main lock will have identical dimensions with the locks at Pickwick Landing and Kentucky dams with the exception of lift. The Wilson lock will be 110 feet wide, 600 feet long and have a single lift of 100 feet. When completed, it will be the highest structure of its type in existence.

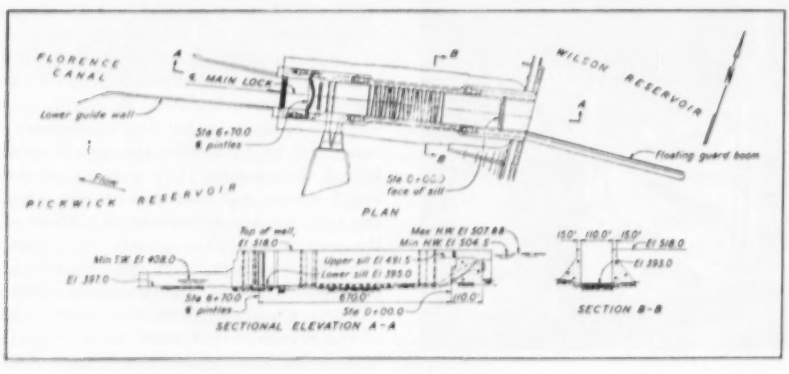
The construction of the lock is complicated by the fact that its upstream end will be built into an existing dam and because of the existence of the long canal downstream. Because of the latter condition, large discharges of water over the dam spillway, or into the river from the new lock, will not affect the water level in the canal immediately, but will require some time to circulate into the canal. The canal water level below the lock will vary up to a maximum of 15 feet below that in the main river, which considerably influences the design of the lock-emptying system.

The foundation rock at the site of the lock is excellent although at an elevation requiring considerable excavation. This is being accomplished with the aid of Ingersoll-Rand wagon drills. Compressed air for these drills is supplied by a 470-hp Ingersoll-Rand PRE stationary compressor, and auxiliary air power for smaller tools is furnished by two I-R Gyro-Flo 600-cfm portable compressors.

An Ingersoll-Rand Calyx core drill is being used to make large-diameter holes that allow engineers to study, in two ways, the sedimentary rock formations underlying the construction area. Thirty-six-inch cores are drilled and removed, and when reassembled in the order of their extraction, reveal the exact character of the underlying rock. To supplement the information thus obtained, engineers go down into the holes and make detailed studies of the rock in place at a considerable distance below the immediate foundation of the lock.

ARTIST'S PORTRAYAL OF NEW LOCK ARRANGEMENT

The new lock on the right will have the highest lift (100 feet) of any single-lift structure of its type. The floating boom can be seen extending into the reservoir above the dam. The old double-lift lock on the left will have a new chamber added at its foot to compensate for the elimination of the lock at the downstream end of the canal. This will make it a triple-lift unit. It will be maintained as an auxiliary for use if the new lock has to be repaired or serviced. A new bridge across the two locks will permit traffic to flow without interruption on the roadway that crosses the crest of the dam. This picture shows the projection of land above the dam that makes it difficult to guide a tow into the present lock.



DETAILS OF NEW LOCK

Water to fill the lock (upper sketch) will be admitted from the reservoir, flowing first through two sloping culverts of gradually lessening section—one incorporated in each lock side wall. At mid-length of the lock, three bottom laterals will carry the water out into the lock. This system is expected to minimize turbulence. Fifty million gallons of water will be required to fill the lock and it will be admitted at a rate of 150,000 gallons a second. The lock will be emptied at the same rate. Most of the water will be discharged into the river through outlets shown in the left portion of the top drawing. The remainder of it will be emptied into the canal, flowing through culverts extending around the downstream gate of the lock.

It is estimated that 200,000 cubic yards of rock must be excavated to make room for the lock. Sand and coarse aggregate for the 425,000 cubic yards of concrete needed to complete the job will be deposited in a gully just north of the new lock location. When needed, they will be transported by conveyor belt over a temporary high-level bridge across the existing canal to mixers to be located at the new site.

The design of the main walls and the downstream guard and guide walls of the lock will be conventional. During the various construction phases, the downstream guard wall will function as a cofferdam with water almost to its crest on the river side. The upper guard wall will be upstream from the dam, in the reservoir, which is approximately 110 feet deep. The completed structure will actually be a floating guard "boom," as illustrated. At Kentucky Dam, a similar guard boom, constructed of concrete, has functioned very effectively. A steel boom for this purpose would have a lower initial cost than concrete, and would be lighter. However, it might not have the stability of a concrete boom, and would undoubtedly require more frequent dry-docking for maintenance than concrete. A decision on the material to be used is yet to be made.

Union Oil Center

Bolted-Steel, 4-Building, $20-Million Development Is Taking Form in Los Angeles

ROBERT JAMES

SCHEDULED for completion in the latter part of 1957, four harmonizing buildings comprising the new Union Oil Center are rapidly taking form in Los Angeles, Calif. Bounded by Beaudry, Bixel, Maryland and Fifth streets, the group occupies a full city block on the western edge of the downtown district and when completed will have cost Union Oil Company more than $20 million. The main or "home office" building will have twelve floors above the lobby and mezzanine, and will reach the height limit specified by the city. Each floor will provide 19,000 square feet of office space. The three other buildings are to be auxiliary office and service units. One of four stories facing Fifth Street will be connected with the main structure at both the lobby and mezzanine levels. Its foundation was designed so that two additional stories can be added as needed. Across the block, fronting on Maryland Street, will be an elevated 3-story structure also having a foundation capable of supporting two more floors. The fourth building will face Beaudry Street and occupies a small plot of ground divided from the main property by Boyleston Street. It will be linked with the main building by two pedestrian bridges across the thoroughfare and contain an auditorium seating 500 persons, a cafeteria and employees' lounges.

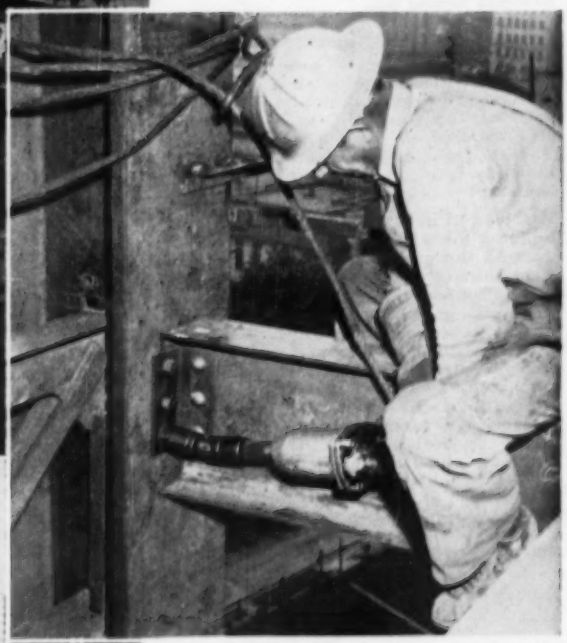
The substructure of the cluster penetrates as far as 60 feet into the soft earth, clay and dolomite subsoil. Three underground levels are to be reserved for automobile parking. Escalators will serve the lower floors and the auxiliary buildings, and extend to the seventh floor of the main structure, the upper floors of which are to be served by express elevators. The parking areas will accommodate 1500 cars and will be reached by a vehicular tunnel extending from Beaudry Street under the auditorium. Wide ramps will also lead down from Bixel and Fifth streets.

Preparation of the site for the Center required the excavation of 400,000 cubic yards of earth from a 300x600-foot area to a maximum depth of 60 feet. Two hundred column footings will support the buildings and substructures and each is founded on from 5 to 109 piles. About 100 carloads of pilings from 25 to 60 feet in length were driven on 3-foot centers to a bearing strength of 50 tons each. To provide for future expansion, foundations for a second height-limit building were also constructed. The latter will connect with the present main structure.

The interior of the buildings is to be made up of nonload-bearing, prefabricated, movable partitions to permit rearrangement of office facilities at will. The structures are being faced with aluminum window wall. Window areas are to be protected from glare and direct

AS IT WILL LOOK

Architect's renderings of the development viewed from two angles. In the foreground of the frontal sketch (top left) is the Beaudry Building, which will contain an auditorium, cafeteria and employees' lounges. It will be joined to the main 12-story structure in the background by pedestrian bridges spanning the intervening Boyleston Street. The other picture views the Center from behind and above. In the left foreground is Bixel Street and one of the entrances to the underground parking area. In the right foreground is Maryland Street and, fronting on it, the Maryland Building. The latter is designed so that its three stories can readily be increased to five. Across the block, fronting on Fifth Street, is the fourth building—a 4-story structure to which two more floors can be added.



FABRICATING THE FRAMEWORK

The 2800 tons of structural steel in the four buildings was joined with 35,000 high-tensile strength steel bolts. The skeleton of the main structure is shown (bottom) almost completed. In the foreground, work was progressing on a substructure that will contain parking facilities for 1500 automobiles on three levels. The picture below shows one of four Ingersoll-Rand Torsion Bar Torque Control Impactools used to bolt up the steel. They were set to produce 320 foot-pounds of torque.

sun by deep, aluminum, vertical fins and horizontal louvers. Sidewalks around the Center will be planted with shade trees and the center pavilion is to be landscaped.

Superstructures of the four buildings are of structural steel joined with ¾-inch high-tensile-strength steel bolts. The main office unit required 1700 tons of steel and 22,000 bolts, the Fifth Street Building has 500 tons of steel fastened with 6000 bolts, the Maryland Street structure required 350 tons of steel and 4000 bolts and the Beaudry Building has 250 tons of steel and needed 3000 bolts. The steel requirement for the group was 2800 tons.

The 35,000 high-strength bolts were applied with Ingersoll-Rand Size 5340T Torsion Bar Torque Control Impactools set to product 320 foot pounds of torque and thus to develop the 29,000 pounds bolt tension specified for the job. The wrenches were supplied with air at 100 psi by portable compressors. Torque settings of the tools were checked each morning by an inspector and, regardless of fluctuations in air pressure, consistently produced torque values well within the set quality-control limits. According to the erection superintendent, the wrenches paid for themselves on the Union Oil Center job.

The Center was designed and engineered by Pereira & Luckman. Del E. Webb Construction Company of Phoenix, Ariz., and Los Angeles hold the general contract. Independent Iron Works, Oakland, Calif., fabricated and erected the structural steel. Patrick L. Lawless, project manager, represents the architects and W. G. Brownie is the architects' chief superintendent. Neil Drinkward is the general contractor's superintendent and John Fahey the manager of job operations. Chet Ghiorso is erection superintendent for the steel fabricator and Ballard Jones the general superintendent. R. C. Nichols is the Union Oil Company's resident engineer.

Mattress-like forms placed between articles of cargo and the sides of freight cars and then inflated prevent loads from shifting and practically eliminate ordinary damage to goods during transit. Known as pneumatic dunnage, the scheme has been developed by the Army Quartermaster Corps. A nylon fabric, coated with neoprene, forms the outer casing and contains a butyl-rubber bladder that is blown up like a football. Studies indicate savings of 78 percent in labor and 46 percent in material as compared with lumber shoring methods. Portable cylinders of compressed air may be used for the inflation.

AUTHENTICATED NEWS PHOTO

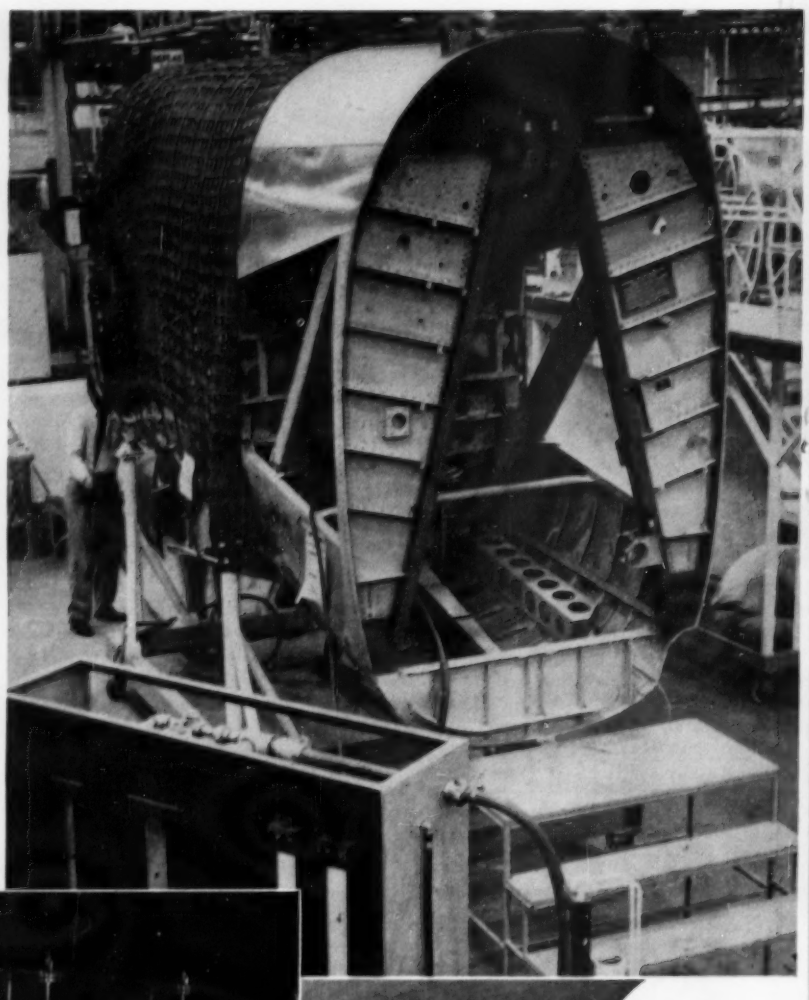
●

Joan Jehlen, a Kansas City sculptress, received a block of marble weighing around a ton—too big and heavy to get into her studio. So, she decided to work on it in the open air at the stone yard where it was unloaded. To help ward off the winter cold, she wore a heavy coat and kept a wood fire going in an old oil drum while she reduced the block with the aid of an air-powered chisel. When completed, the statue will be placed on the campus of Marymount College at Salina, Kan.

WIDE WORLD PHOTO

COMPRESSED AIR AT WORK

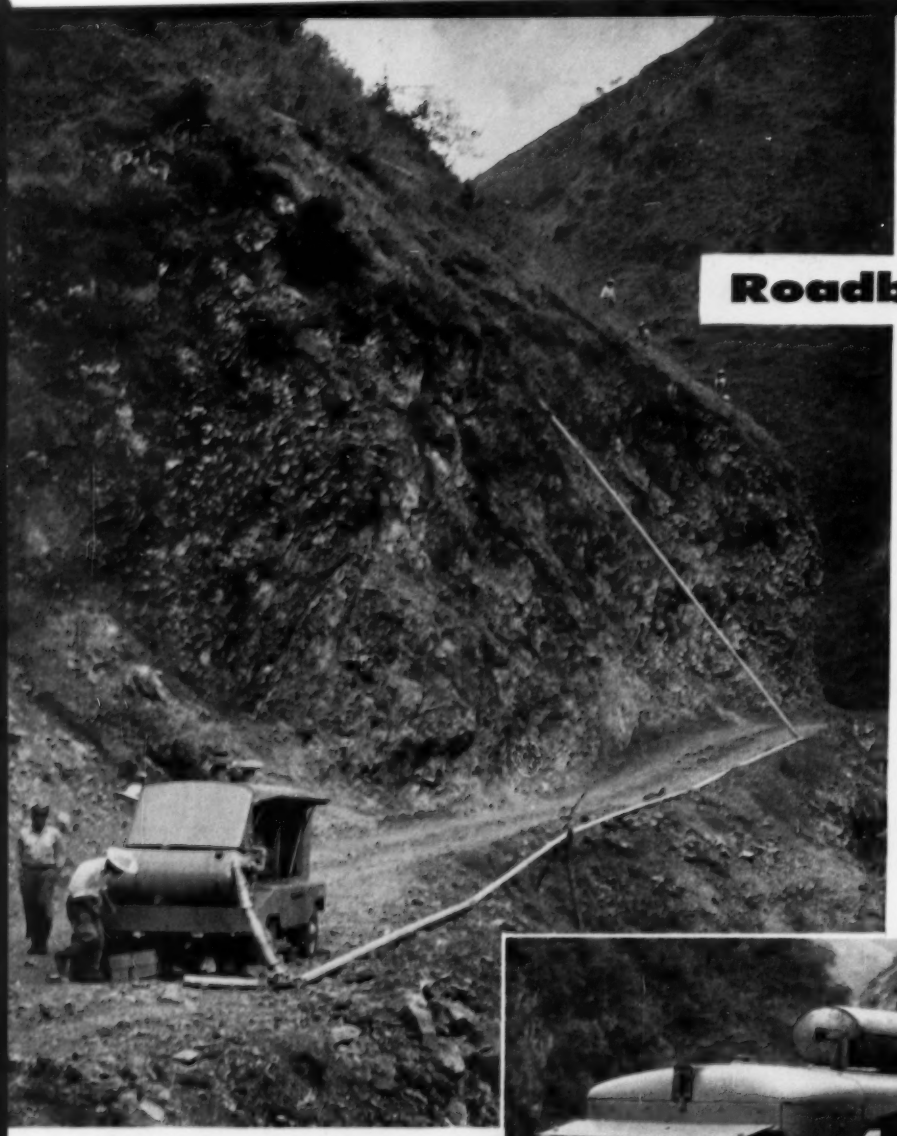
The assemblage shown at the right is the tail gunner's compartment of a B-52 bomber shown in the making at the Dallas, Tex., factory of Temco Aircraft Corporation, which supplies this and other fuselage sections to Boeing Airplane Company. When flown by Air Force pilots at altitudes ranging to more than 50,000 feet, the compartment is pressurized and it is here being tested to determine its tightness and strength. While it is being subjected to 11.2 psi of air pressure, the webbed blanket of nylon surrounding it protects the workmen from possible injury if the structure should fail.



The type of glue used and the method of bonding the wood components have a lot do with the purity of tone and structural soundness of such instruments as guitars, mandolins and ukeleles. The curves, multiple radii and thinness of the stock make gluing an exacting procedure. The Harmony Company, of Chicago, known for its fine instruments for nearly 65 years, uses modern methods in assembling them. A urea resin glue made by National Casein Company is carefully applied, then it is cured by resistance heating while the bodies are held under precisely controlled pressure applied by air cylinders.

Some subway passengers in Paris are enjoying cushioned rides on air. Trains on the Chatelet-Mairie des Lilas line of the Metro system have been outfitted with pneumatic tires. The wheels run on strips of hardwood imported from Africa and laid along the outside edge of the rails. Regular railway wheels are mounted on the inward side of the tires but normally ride an inch or two above the rails and contact them only in case of tire blowouts or deflations. Besides adding to passenger comfort and greatly reducing noise, the pneumatic tires tend to prolong the service life of cars and roadbed.

AUTHENTICATED NEWS PHOTO



Roadbuilding Under Difficulties

Contractors Battle Rugged Terrain on Inter-American Highway in Guatemala

HARRY E. HARPS

THE ACCOMPANYING pictures show why the Inter-American Highway has not been completed on schedule. They convey an idea of the difficulties presented by the terrain in that part of Guatemala known locally as "El Tapon" (The Plug) because it is one of the final barriers on the 1590-mile route from Texas to the southern border of Panama.

The 25-mile stretch between Cuauhtemoc, Mexico, and Colotenango, Guatemala, which includes the territory illustrated, is called the toughest of all. There the contractors must use mountain-goat tactics to carve a shelf roadway from the steep slopes of a narrow, twisting canyon of the Cuchumatanes Mountains through which the wild Selegua River runs. In some places the gorge narrows down so much that the opposing walls almost seem to touch.

A 5-month rainy season and a series of landslides and rockfalls have complicated the already serious problems in recent months. Slides of almost daily occurrence have often obliterated work that had been done. The Fisher Con-

WHERE THE COUNTRY STANDS ON END

In spots like this (upper picture) it is difficult even to get compressed air to places where it is needed. Here, lightweight aluminum piping is strung from an Ingersoll-Rand Gyro-Flo 600-cfm portable compressor to serve six or eight drillers, several of whom are partly visible. They use hand-held drills of necessity—mounted types are out of the question. The roadway shown is solely for moving men, equipment and materials; the highway will run at a higher level. Two Gyro-Flo 600's supply air for all the drilling of the Oceanic Construction Company on this section near Colotenango, Guatemala. One of these diesel-powered machines is shown at close range in the lower view.

BLOWING A HOLE

A geyser of rock dust rises from a blast hole being cleaned with compressed air. Holes were being drilled to depths of 15 or 20 feet. Because of the difficulties of working on the steep slopes, two men were assigned to each drill, normally operated by one man. Hard hats were supplied by the contractor as a safety precaution.

tracting Company, of Phoenix, Ariz., lost one portable compressor when a slide knocked it into the chasm and buried it, and several tractors were badly damaged.

Workers have many times been cut off from their base of supplies. Native packers then transported the fuel, oil and grease necessary to keep mechanical equipment operating. At such times progress has been slowed greatly because half or more of the available equipment has had to be used to clear the supply road. One time-saving factor is that most of the material excavated can be pushed over the side and allowed to roll or slide to the bottom of the canyon.

A highway connecting the Americas has been many years in the making. It stems from a proposal to the United States Congress by David Davis in 1880 that a Pan American railroad be built. The matter was discussed at the First International American Conference in Washington in 1889 and at succeeding similar meetings for the next 50 years. Meanwhile, the invention and adoption of the automobile turned thoughts toward a highway as well, and the construction of one was proposed in 1923 at the Fifth International Conference. The Pan American Highway Congress was formed in 1925 to promote it and in 1929 the United States Congress appropriated $50,000 for an initial survey.

Work began soon afterward, but the initial hope of completing the job in 5 years soon faded out. However, 62 percent of the route from the United States to Panama, including paving, was finished in the 1930-40 decade and 16 percent more of it could be traveled in dry weather. This was considered good progress in light of the problems imposed by the topography. During the same period, South American countries completed 5000 of their 5757-mile total. That section is now continuous from LaGuaira, Venezuela, to Rio de Janeiro, Brazil, except for a small gap in Ecuador.

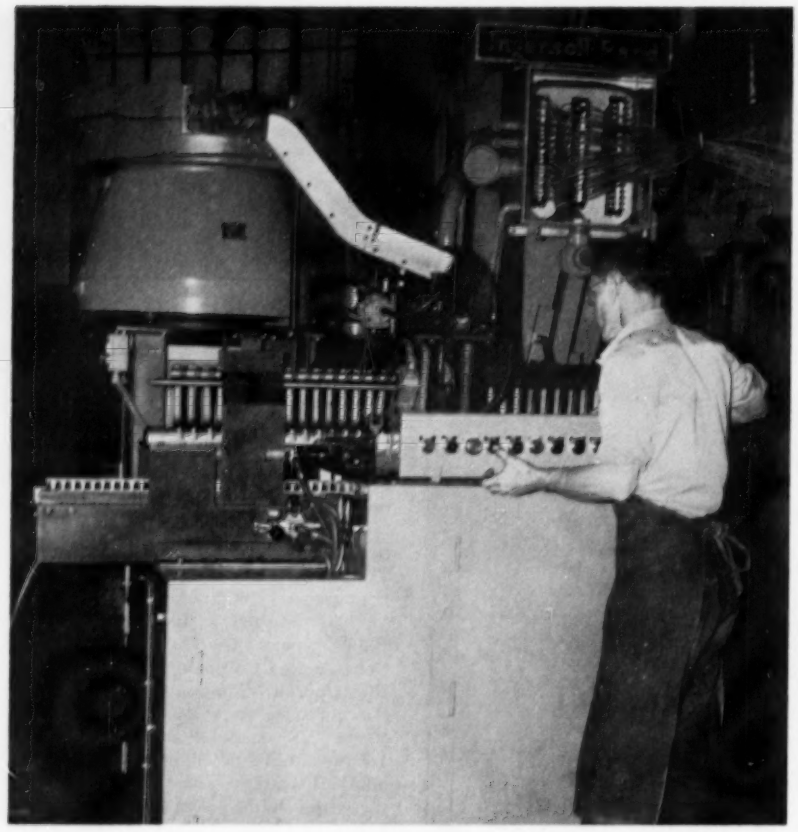
The Bureau of Public Roads in Washington estimates that all remaining sections of the northern portion, which is known as the Inter-American Highway, will be completed within 2 years, although it may not all be paved then. In 1955, efforts to get the job done were stepped up and the United States now grants aid to the Central America nations of up to two-thirds of the cost of the work contracted. So far Uncle Sam has put up $128 million by congressional action and is expected to spend $100 million more. In addition, our War Department made expenditures during World War II, when the strategic importance of the highway was keenly realized.

Four contractors are working in Guatemala, three of them in "The Plug." The Fisher firm previously mentioned (Compania Contratista Fisher de Guatemala) finished a 10-mile section in 1956. Presently the Thompson-Cornwall Construction Company and the Oceanic Construction Company, on whose job our pictures were taken, are located there. If scheduled completion dates are met, mid-1957 should bring a passable all-weather gravel-surfaced roadway from the Mexican border into Guatemala. Definite dates of paving are unavailable, but if all goes as planned an asphalt surface 15 feet wide will be applied after the earth has settled.

Completion will make the present transshipment by rail of automobiles from Tonala to Tapachula, Mexico, unnecessary. The latter town is connected with the interior of Guatemala by a fair road. A passable road will also allow motorists to drive from Texas through part of Central America and into the eastern end of Costa Rica, near the small town of San Isidro del General.

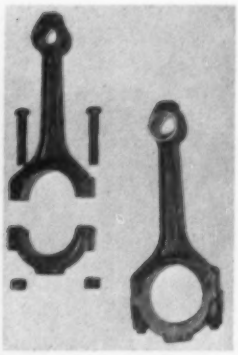
Guatemala, however, is not the only site of construction activity. As of November 1956, only one project remained to be put under contract in Costa Rica. Bureau of Public Roads officials expect construction there to be finished during 1958. Impassable conditions will continue until the bridges are finished and some are not yet under contract. Perhaps by 1959 the road will be passable from San Isidro del General to David in Panama. No construction is necessary along the remainder of the route in Central America.

The results of 3 decades of planning and work are thus in sight. Before long, motorists will be able to drive from Texas to Panama City as quickly as they now go from New York to San Francisco. They will little realize the engineering and construction difficulties that had to be surmounted because their eyes will be on the scenic attractions.



AUTOMATON

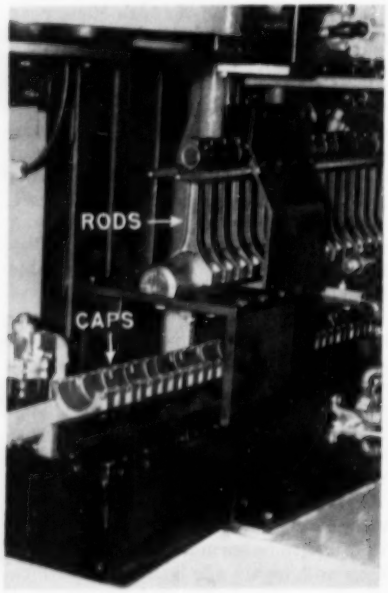
The Ingersoll-Rand automatic air-powered connecting rod assembler. The rod-and-cap loading station is at the left and operations progress from left to right, with finished assemblies being either dropped onto a conveyor or delivered to a transfer machine and relayed to the machining and grinding operations. The conical hopper, at the left above the machine, is the bolt-feeding device. Along the front of the machine, in the right center, is the push-button control panel with provisions for fully automatic operation, manual control and "jogging" or independent cycling of each stage in the assembly process. The wires extending from the box above the control panel lead to the control switches and are normally concealed on operating machines.



ROD—APART AND ASSEMBLED

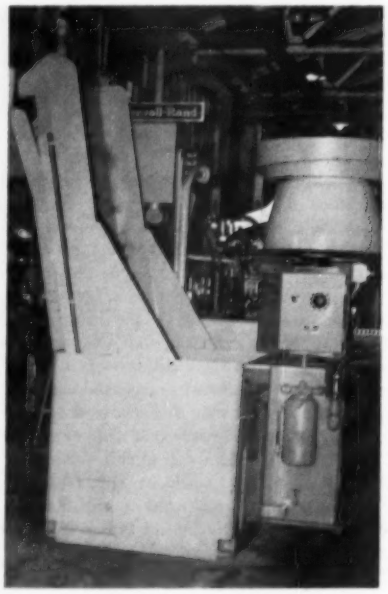
Automaton for Auto Industry

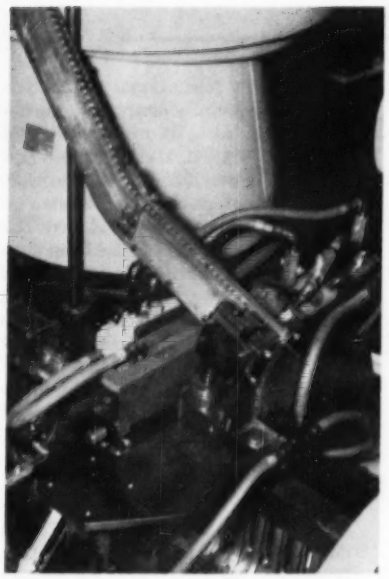
AUTOMATION has done much to step up automobile production and at the same time hold down costs. Indeed, it has been estimated that without the automated processes now in use, the prices of modern automobiles would be from 3- to 12-percent higher than they are. Automobile manufacturers and suppliers are continually searching for new means to speed up production and/or to cut costs. One bottleneck and high-cost operation in engine production has been the assembly of connecting rods, not only on the crankshaft, but prior to machining. The rods reciprocate at high speeds and must fit perfectly in order that their engines may run the thousands of miles that most drivers expect. The two bearing holes in the rods must be machined to fine tolerances to achieve



FEEDING STATIONS

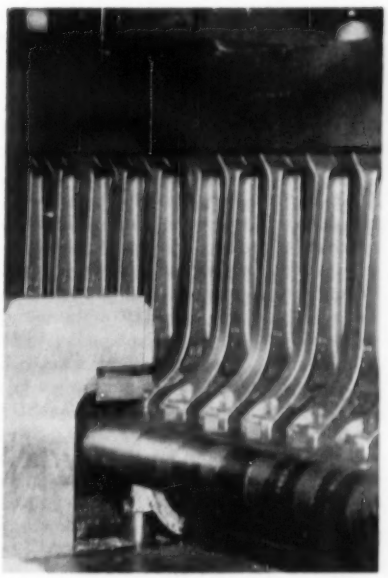
At the left is the rod-and-cap loading station. Rods are placed so that the crank bearings ride on a circular mandrel. The smaller piston-pin-bearing ends rest between the tines of an air-powered fork-shaped lift-and-carry transfer device that delivers the rods to a positive indexing mechanism, which in turn, positions them for ensuing operations. From a starting position, the fork moves upward, picking up the rods and carrying them into the machine a distance approximately equal to the width of one rod, thus feeding them one at a time. It then moves down, transferring the weight of the rods to the mandrel and returns to the starting position. Caps are placed in a V-shaped channel below the rods with the bearing surfaces upward. The bolt flanges ride on rails and project beyond their sides where they can be engaged by another lift-and-carry mechanism that feeds them to the machine. The picture at the right shows the back of the machine. On the left is the nut feeder. Inverted V-shaped lugs on an endless belt running through the hopper, pick up nuts and elevate them to feed tracks leading to the nut runners.





BOLT FEEDING AND PRESSING

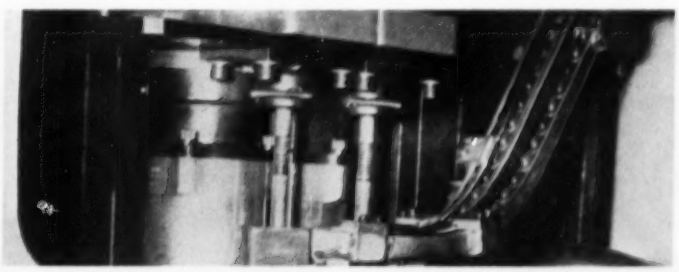
The picture at the left shows the bolt feeder from which bolts are oriented and dropped into their holes in the rod. A "splitter" picks up two bolts in slots corresponding to the holes in the rod. To properly orient the irregular-shaped bolt heads, they are fed from the splitter into a flying escapement, driven back and forth by an air cylinder. As the escapement moves, the bolts are spun and, as they turn into proper alignment, drop through dies of a shape corresponding to that of the bolt heads. A simple toggle escapement then releases them into tubes that guide them down into the holes on the rod and a light press sets them to maintain the proper orientation. The rods are then indexed by metal fingers that drop down between the rods, carry them forward, retract and move back to the starting position. At the next station (picture at right) a heavy press, also pneumatically actuated, forces the bolts home. At the same time a cap is picked up from the lift-and-carry track below and slipped over the bolts. Then the machine indexes again and the fingers carry the rod on to the next step.



this and the only way to do it accurately is to machine the rod fully assembled and when pulled up to the same torque as it is to be under when in operation.

Ingersoll-Rand Company has developed a pneumatically powered assembly machine for putting connecting rods together prior to the final machining steps. The electrically controlled automaton has a design capacity of 700 completed rods per hour; however, in tests at the manufacturer's Athens, Pa., plant, has cycled at rates up to 900 per hour. One operator is required for the newly developed assembly machine and, because it will replace seven units of the manually operated equipment now used, will free six operators for other work. The I-R unit requires only about the same floor space as the older type.

The accompanying pictures and captions describe the complete operation of a typical machine—one that was built to assemble rods for an 8-cylinder, V-type engine. The rod assembly consists of six parts: the rod, its cap, two bolts and two nuts. The rods and caps are magazine fed, and nuts and bolts are automatically placed from hoppers. In general the machine feeds the bolts, orienting them in relation to their non-symmetrical heads; presses them into the rod; places the cap; feeds, starts and runs the nuts to a specified torque—in this case, 45 foot-pounds—and ejects the finished assembly. It is designed so that if a bolt, nut or cap is missing, that information is transmitted to the operator by signal lights and the machine automatically shuts down and is switched to manual control, thus enabling the operator to correct the mistake and return the machine to auto-control. This safeguard assures that only complete assemblies will be unloaded.



NUT SETTING

At the third station, nuts are run on the bolts to a specified torque of 45 foot-pounds. Torque is controlled by regulating the air pressure delivered to the wrenches and letting them run to a stall. Cycle-time is adjusted to the time required for the wrenches to run the nut. All other operations are interlocked with the nut-running operation, and thus by regulating its timing, the capacity of the machine can be adjusted up to its peak. The nuts are fed through hollow spindles into the wrench sockets from the rear. Nuts are delivered by tracks to loaders positioned just below the nut setters (above). As the wrenches are raised to the bolts and the nuts engaged, two lances spear one nut each and raise them to rotating spindles, forcing them past a simple spring retainer and advancing the column of nuts upward in the spindle in order to be ready for the next cycle. After the nuts are torqued, the completed assembly is ejected off the end of the mandrel onto a conveyor belt. Both the nut pick-up lances and nut runners are raised and lowered by air cylinders. The wrenches and their cylinder can be seen in the picture at the left in which the unit assembly is pulled out of the machine housing. The entire machine is made up of a series of readily removable sub-assemblies that are on rollers and can be pulled out for easy servicing.

This and That

They Use Air Everywhere

The growing use of air power in woodworking, which was covered in our April issue, is apparently not confined to this side of the Atlantic. A report from Stockholm on an exhibition arranged there by a branch of the Swedish Wood Industries comments that "compressed air has found its way into the woodworking industry of late and was evident in many displays." As in this country, pneumatic cylinders are commonly employed for clamping components while they are permanently joined with glue, nails or screws. Sweden's annual output of wood products is valued at $400 million and wood is still called "the base of Swedish industry" despite the recent trend towards plastics and light metals.

* * *

Novel Wind Mill

A British inventor has patented in the United States a wind mill that "inhales" air. Called an anemo-electric power plant (anemo denotes an air current), it has a 2-blade propeller that swings around in the conventional manner to face into the wind. However, its propeller blades are hollow and vented at their outer ends. The tower that supports the propeller has a hollow interior that is connected with the propeller at its center. As the blades revolve, they draw air in at the bottom of the tower and discharge it through their tips. The rush of air through the tower that is thus created is used to operate a turbine that is coupled to an electric generator. The inventor, Robert J. Perdue, is an employe of DeHavilland Propellers, Ltd.

* * *

Heat From Garbage

During the past winter some 800,000 residents of Paris were warmed with heat that came partly from burning garbage. One of two new municipal steam plants is a combination garbage-disposal unit and heat generator; the other one burns fuel oil. These and two other older plants can produce more than a million tons of steam annually. In winter the steam is distributed through a 30-mile pipe system to government buildings, hospitals, large stores and other customers.

* * *

Geochemical "Thermometer" Finds Ore

What may be the twentieth century's greatest single contribution to the prospector's art has been evolved at California Institute of Technology, according to Dr. Robert P. Sharp, head of the geological division. The Cal Tech studies are based on the theory that most metallic ore bodies were formed by magma intrusions into carbonate rock formations. The new prospecting system is simply the measurement of the ratio of ordinary oxygen in rock to a rarer, lighter isotope. The more of the lighter form of oxygen that is found, the closer one is supposed to be to an igneous intrusion. Evidently the high-temperature fluids caused changes in the country rock, the degree of which varies directly with the distance from the hottest point or ore center. A special mass spectrometer is used to do the measuring. The theory checked closely with actual conditions when tested in the limestones at Leadville, Colo., that contain rich gold, lead and zinc deposits.

* * *

Wall of Dinosaur Bones

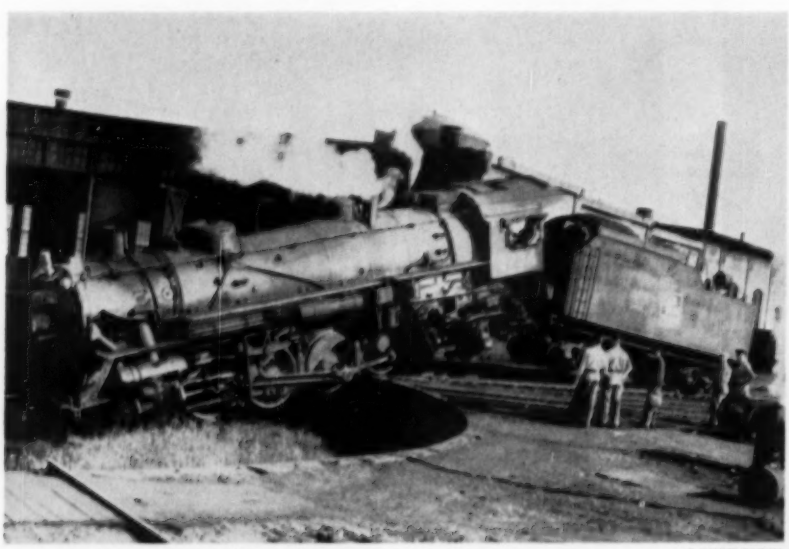
In dinosaur National Monument, a reservation of about 80 acres located 12 miles from Vernal, Utah, an unusual museum is being built, for one of its walls will be made of dinosaur bones. During the Mesozoic Era, reptiles roamed this area. Ancient rivers collected their bodies and deposited sand and other sediment over them. The material hardened into sandstone, preserving the bones. In 1909, the first fossil was discovered and subsequent quarrying has revealed a concentration and variety that has become the largest known. On October 4, 1915, the reservation was created.

The proposed museum will stand in an area that is now covered by a corrugated iron shed to prevent fossil weathering and deterioration. The cost is estimated at about $225,000 and completion will be in 1958. Designed by Anshen & Allen, architects from San Francisco, Calif., the building will enclose a notch in the ground and will have a butterfly roof to follow the contours of the area. Sides will be of glass so that visitors can see the sandstone-fossil formations. The back wall, 130 feet long and 30 feet high, will be the face of the quarry. At least one fossil bone occurs there in every 6-foot space.

* * *

Paper From Chips

Georgia-Pacific Corporation is erecting at Toledo, Ore., a new plywood and lumber mill and an adjoining pulp and paper mill that will use waste from the first plant as raw material. Many west coast paper mills now process chips that they buy from sawmills, but have to transport them considerable distances, which increases costs. This will not be the case in this instance. The chips will be blown from the mill where they originate through a pipeline to a storage pile at the pulp mill.



AP WIRE PHOTO

COMPRESSED AIR NOT AT WORK

Here's what happened when a fireman at the Grand Trunk Western Railroad roundhouse in Detroit, Mich., moved a 330,000-pound steam locomotive before sufficient air pressure to brake it had been built up. The front end plunged into a 6-foot pit, but no one was hurt. Locomotives and trains have been under the control of compressed air since George Westinghouse's memorable brake invention.

Robot Gavel For Tired Toastmasters

An automatic gavel for presiding officers at meetings is the latest product on the automation horizon. David Choate, of Minneapolis-Honeywell Regulator Company, a leading maker of control instruments, thought up the gadget while serving as president of the Wilmington, Del., section of the Instrument Society of America, and has bequeathed it to his successor. A wave of the hand depresses a button that trips a switch and causes the gavel to strike an anvil. A built-in "mood selector" offers the presiding officer a considerable range of striking intensities to choose from. These are labeled Tired, Normal, Mad, Drop-Dead and Apoplectic. A buzzer sounds with the latter.

* * *

Retrieves Subway Tokens

Walter McInnes, an employe of the Transit Authority in New York City, has invented a vacuum-tube "retriever" of tokens deposited in subway turnstiles. At most subway stations, token sellers occupying booths periodically "close shop" while they visit the turnstiles to replenish their supply of the small metal disks. The procedure is to transfer them from the canvas bag into which they fall to a galvanized iron bucket and carry them back to the booth. At some of the busiest stations, retrievers are employed during rush hours and this costs the Authority about $100,000 a year. The tube idea may save that sum eventually.

McInnes's brainchild, planned in the basement workshop of his home, has demonstrated that it can withdraw tokens from a turnstile at the rate of 100 in 1½ seconds. In tests to date the tubes have been run overhead to be out of the way. Some day, if the collection system is adopted, they will be embedded in the concrete floors.

McInnes got the idea when he noticed some of his wife's bobby pins in the sack of a household vacuum cleaner he was emptying. A ⅓-hp motor drives the vacuum pump that produces the necessary suction to draw the tokens through stainless steel tubing into the change booth, where they drop into a plastic cylinder. A counter may be added at the delivery end.

* * *

Record Plow From Australia

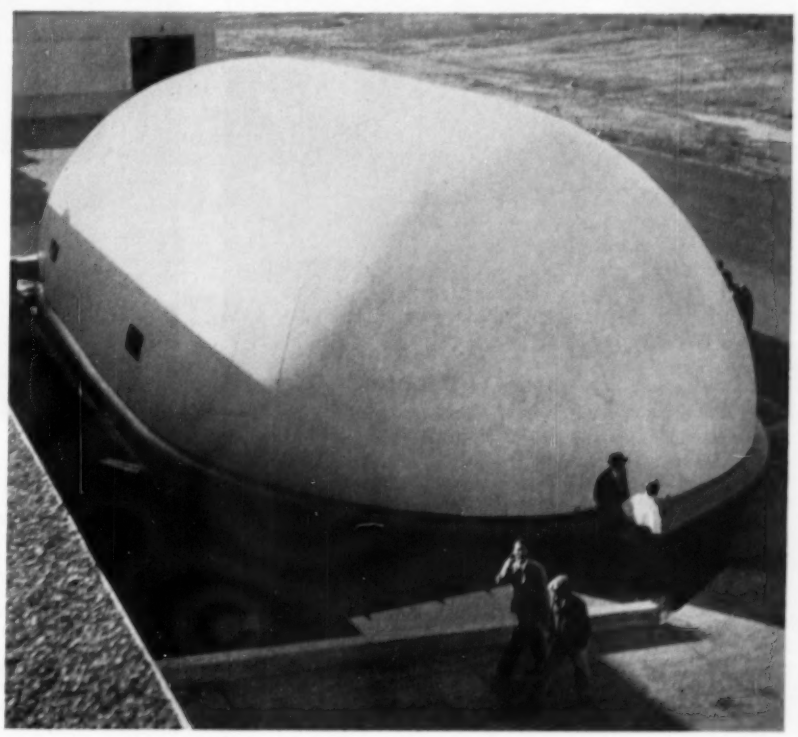
A plow 58 feet long has been manufactured in Australia for service in the United States. As might be expected, the outsize earth rooter will be used in Texas, which has a reputation for doing things in a big way. It will turn the sod on the fabulous King Ranch at Kingsville. R. J. Kleberg, Jr., one of the owners of the ranch, has interests in Queensland and while there saw a picture of a somewhat smaller plow in the plant of Napier Bros., Ltd., at Dalby. Visualizing its possibilities on the expansive Texas acreage, he ordered one to be delivered as soon as possible. It consists of five 10-foot units coupled by extensions and independently hitched to the main drawbar. It is called a chisel plow and has 74 tines spaced 9 inches apart. It will be drawn on the King Ranch by two Caterpillar D8 tractors. It is claimed to be the largest plow ever built.

Compressed Air Supports Warehouse

FROM a 5x3-foot package comes a portable warehouse that reportedly is large enough to hold 2 million pounds of packaged goods. The building, supported only by air at a low constant pressure, contains approximately 64,000 cubic feet of storage space, weighs about 400 pounds and can be erected by three men in 1 hour. It is made of Fiberthin, a tough, paper-thin nylon fabric with excellent resistance to scuffing, oils, gasoline, most acids, alkali, salt water, sunlight and weathering.

The building was developed for Calumet Industrial District Company by the United States Rubber Company, and is described by Addison Brown, president of CID, as "the answer to warehousemen's need for low-cost, low-maintenance, flame-resistant, temporary warehousing." Food, machine tools, cement, chemicals, lumber, rubber goods, hardware, building supplies, paper and general commodities, reportedly, can all be stored safely. The structure costs less than a dollar per square foot to construct, as compared with $3 per square foot for prefabricated metal buildings. It will be offered to industry as a complete engineering service package; that is, erected with guaranteed maintenance and subsequent removal by CID, using its own trucks and crew.

To erect it, the Airhouse, as it is called, is first spread flat on the ground. It is securely anchored by 23,000 pounds of water contained in a 15-inch tube encircling the 80x40-foot oval base. Air from a compressor or blower is injected into it. The building bulges upward and outward, its dome rising to 20 feet. Tension keeps the walls and roof taut. The structure is strong enough to withstand high-velocity winds and its roof reportedly will support a heavy snow load. The compressor maintains a constant stream of low-pressure air that enables the building to retain its shape, even when the door is opened to permit the entry of fork lift trucks, and acts as an air-conditioning unit. The building need not be completely airtight to maintain its shape when pressurized.



SAVING WITH AIR POWER

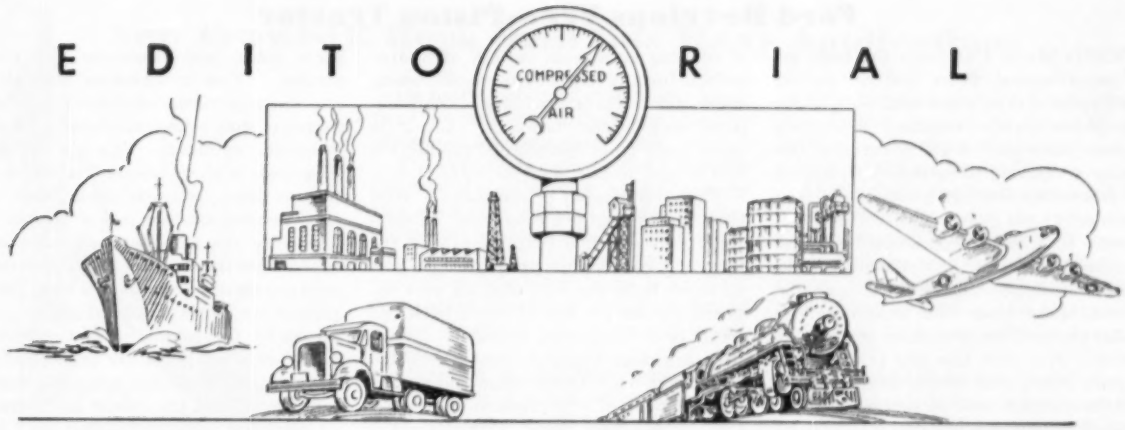
Power Utility Speeds Pole Setting

ONE WESTERN electrical utility has found that converting to compressed-air-powered tools can pay off in a big way on an everyday job. The company outfitted each of its pole-setting crews with a small portable compressor and a pneumatic digger, backfill tamper, drill and Jackhamer. Formerly it took an average of 18⅔ man-hours to set one pole. Now the job, portrayed in the accompanying pictures, is done in only 1.8 man-hours, a clear saving of more than 16½ man-hours.

AIR-POWERED POLE SETTING

The illustration at the left depicts the greatest timesaver in the pole-setting operation—sinking a 24-inch diameter hole 6 feet into the ground. Supplied with air by the Ingersoll-Rand 3R36 compressor visible on the truck, the I-R Size 75 Digger shown saves 14½ man-hours per hole by loosening the soil so that it can be easily shoveled out. If rock is encountered, a small I-R J-10 Jackhamer is used. After placing the pole, the hole is backfilled and tamped (upper right). By the manual methods formerly used, tamping required 40 man-minutes. Now, one man using an I-R Size 34 Tamper with special long-handle extension, does the job in an average of 7 minutes. The Digger also performs two other tasks. Before the poles are erected, steel step-spikes are driven into holes predrilled with an I-R 2J air drill. The operation is facilitated by a special driver attachment fabricated from the shank and rod of a standard chisel blank, a piece of hose with a slot cut in it and a hose coupling, as shown in the small insert at the right. In addition, ground rods are driven alongside certain poles. When hand sledges were used to drive the ¾-inch diameter, 7-foot-long rods, it required 2 man-hours for the operation. The Digger, operated by one man and using the special spike-driver attachment, does the job in 10 minutes. All of the equipment is lightweight and easily handled. The digger in the picture at the lower right, for example, can be used while the crewman is on the pole. The compressor can easily be carried by two men, or wheeled on a special wheelbarrow-like carrier by one man.

EDITORIAL



CHANGING TIMES

RECENT NEWS stories reflect the vast changes that time has brought to the mining industry. From Cripple Creek, Colo., comes word that the Independence Mine, which made its discoverer, Winfield Scott Stratton, the camp's first millionaire, is to be turned into a showplace for tourists. For a fee, visitors will be lowered to the fourth level and there guided through a labyrinth of workings that once pulsed with productive life. The Independence has been virtually inactive for many years while its owners waited in vain for the repeal of regulations fixing the price of gold. The announcement adds, somewhat hopefully, that when the summer tourist season is over, the mine will be opened to a few leasors. Meanwhile, some of the money collected from visitors will go to help support the Cripple Creek Hospital.

Far to the north, another news dispatch informs us, the remote, largely untouched Ungava district of New Quebec that juts northward along the eastern shore of Hudson Bay is being invaded by hordes of prospectors for copper and nickel ore. This rush furnishes sharp contrasts with those of the Old West. Stratton, for example, was a carpenter and amateur mineralogist in Colorado Springs. Prospecting was a sideline followed on week ends and holidays. He discovered the Independence on a Fourth of July jaunt into the hills in 1891; hence the property's name. He had little money, no backers, no company connections.

The Ungava rush, on the other hand, is being promoted by "well-heeled" mining concerns that may spend as much as $10 million on the quest. One company alone has budgeted $600,000 for the campaign. The participants hold concessions from Quebec's Department of Mines covering from 50 to 400 square miles each. To prospect these vast areas, they will resort to modern scientific aids and a lot of preliminary work, at least, will be done from the air. In order to keep the concessions alive, they will have to pay $80 a square mile to the provincial government and do $3000 worth of assessment work per square mile during the next 3 years.

Most of the concessionaires have joined forces to organize an airlift to get men and materials into the region, which is 1100 miles due north of Montreal. Aircraft capable of carrying 18,000 pounds per trip will shuttle back and forth from Val d'Or, Quebec, to a 6000-foot runway being constructed at Esker Lake, convenient to the area to be combed. Close to 1000 tons of equipment and supplies are to be flown in this year. The current freight rate is $520 per ton.

The de luxe mass prospecting expedition was touched off by discoveries made by Le Moyne Ungava Mines, which is financed by a Canadian subsidiary of American Smelting & Refining Company. First reports of Ungava mineralization came from a reconnaissance survey along the Hudson Bay coastal area in 1898 by A. P. Low of the Geological Survey of Canada. He noted sulphide deposits that appeared to persist toward the inland. Because of the area's isolation, no work was done until 1931, when a party headed by Murray Watts, a geologist for the Cyril Knight Prospecting Company, went there looking for gold. The party traveled along the coast of Hudson Bay for 1200 miles in 22-foot canoes. Striking inland, they used dog-drawn sleds in winter and made pack animals out of the dogs in summer, which was the only time the ground was bared for examination. Their only contact with civilization was the arrival of mail twice a year—once by dog team and once by boat.

The trip revealed extensive sulphide zones of promise, but they were still too remote for economical development. In 1955, Watts flew there with two companions representing Le Moyne Explorations, Inc., a subsidiary of Little Long Lac Gold Mines. That group holds a concession on the eastern end of a 30x200-mile strip that has been pretty well defined as containing the mineralized outcrops. Geologically, the surface rocks are a part of the vast pre-Cambrian shield that harbors much of Canada's known mineral wealth. There are no trees, the climate is sub-Arctic, and ice reaches 8 feet in thickness. Land transportation will be by tractor-drawn trailers. The belt to be examined is a little northwest of the northern end of the deposits of iron ore recently opened up by construction of a 362-mile railway running northward from the St. Lawrence River.

Despite the rigors of the region, observers say year-round mining operations are practical; in fact it may be that conditions are less austere than in some other mining districts of Ontario and Quebec or even along the Minnesota iron ranges. The principal annoyance is wind, which averages 22 miles an hour in winter and reaches 100 miles at times. Buildings will consequently have to be tied down and built tight to keep out the fine snow that sifts through walls that look to be solid.

Thus, prospecting techniques have changed strikingly since Stratton's time, but some similarities exist between the modern and earlier eras. For one thing, the cost of living in the outposts of civilization are higher than elsewhere. Fort Chimo, nearest point to the Ungava focal zone where a transient can get accommodations, was established by the U. S. Army during World War II as a base for airplanes flying wounded soldiers home from Europe. When the Army moved to newer and bigger quarters, the natives were given the buildings and supplies at the fort. What was built to be a garage has now become the Hotel Chez Paulo. A berth there in a double-decker bunk with five other men in the room costs $5 a night and you furnish your own sleeping bag. All food has to be flown in at 45 cents a pound freight charge and a loaf of bread sells for $1. Meals at the hotel, regardless of which one, cost $4 each. But the food is said to be excellent and second helpings are not only permitted but encouraged. Verily, the old timers never had it so good!

Ford Develops Free-Piston Tractor

FORD Motor Company has built an experimental farm tractor named the Typhoon that is powered by a 50-hp free-piston turbine engine. Producing heated gases that drive a turbine, the engine is claimed to be especially suited for tractor service. It is minus much of the mechanical power train of conventional internal combustion engines. Crankshaft, camshaft, connecting rods, mushroom-type intake and exhaust valves, spark plugs and most other familiar parts of reciprocating engines are absent. Nor does the new power plant require costly and scarce heat-resistant metals that are used in current gas turbine or jet engines.

The engine is reported to be capable of running on a wide variety of hydrocarbon fuels of low volatility, including many agricultural products. The company emphasizes, however, that it is years away from commercial production and is now undergoing tests and study.

The compression of air plays a vital part in the engine's operation. Essentially, it is a gasifier that operates on the 2-cycle diesel-engine principle. It gets its name from the fact that its two opposed pistons are free to move back and forth in a horizontal cylinder. When they are close together, fuel is injected into the space between them and ignited by the heat of compression of the air trapped between them. Combustion of the fuel forces the pistons away from each other and produces the power stroke. This compresses the air in the outer portions of the cylinder and forces it into adjacent chambers called "bounce" cylinders. This air, acting as a spring, is then released to drive the pistons back towards each other and thus initiate another power stroke.

During the combustion stroke, some of the air in the cylinder is forced through reed valves and into an "air box."As the pistons are moved outward on the power stroke by the expansion of the burning gases, exhaust ports are uncovered, allowing most of the hot gases to leave the cylinder. Then the intake ports are uncovered and air from the "air box" flows through the cylinder and removes the remaining gases. All of the gases go into a surge tank and from there to a turbine wheel that is revolved by their pressure to supply power to the tractor.

To start the engine, a vacuum pump draws air out of the "bounce" cylinders and thus pulls the pistons back in the cylinder, away from each other. Compressed air is then admitted from storage reservoirs into the "bounce" cylinders to force the pistons inward for the initial compression and firing.

The Ford engine has a bore of 3.75 inches and an effective stroke of 4.2 inches. The mechanical compression ratio is 15 to 1. The combustion gases have an initial maximum temperature of 1000°F, enter the turbine at 940-960° and are exhausted at a maximum of 750°. Pressures are 22-40 psi at intake ports from the air box, 16-27 psi in the surge tank and 15-25 psi at the turbine.

"We have high hopes," states M.D. Hill, manager of Ford's tractor and implement division, "that this tractor may be the forerunner of a totally new concept of farm power. It brings us to the threshold of power capabilities of which farmers could previously only dream."

NEW TRACTOR ON TEST

The experimental Typhoon towing a dynamometer that measures its power. Air for the free-piston engine is drawn through an opening on top of the hood. Short stacks direct exhaust gases high into the air. The transmission provides for ten forward speeds and two reverse speeds and gears are shifted by power.

Sensor Ceramic Measures Humidity

SCIENTIFIC curiosity in a strangely behaving material has led to the discovery of a ceramic that has no natural counterpart and may well prove to be the finest humidity-sensing element known. This man-made material is being tested by Horizons, Incorporated, a Cleveland, Ohio, industrial and governmental materials research organization, and is said to respond well-nigh instantaneously to changes in relative humidity, a vital consideration wherever humidity and moisture controls are essential to work or a manufactured product, where dehumidifying or air-conditioning units must be triggered to maintain constant conditions, etc.

To determine the effectiveness of the ceramic, which was being studied among others when its instability was noted, the investigators constructed a simple core wound with conducting wire. When this model was placed within the curled fingers of the hand, response was rapid and changes in relative humidity could be measured sharply and quickly. Because of these factors and because the material does not become sluggish when the humidity rises to 100 percent, as do conventional sensing elements, there is a possibility that it may be useful in the production of superheated steam.

At present, findings are still theoretical. When calibrations are completed and similar responses are measurable in succeeding batches of the material, cores and other shapes will be tested under service conditions.

"Power-shovel operator."

New Crawl-IR Rock Drill Has Many Applications

THE CRAWL-IR is a new, knee-action crawler-mounted rock drill developed by Ingersoll-Rand Company. Mechanized and self-propelled, the Crawl-IR has wide application in road-building, quarrying and general construction work. The Crawl-IR is equipped with a new superpower D-45 Ingersoll-Rand drifter, 4½-inch bore, with six rotation pawls that give it an extra-powerful rotation system. The D-45 utilizes a closed-type fronthead, permitting the use of a separate alloy shank piece sealed in with "O" rings. The D-45 is equipped with standard, neutral and reverse rotation features. The separate shank piece and closed-type fronthead are said to insure efficient cleaning of deep or large-diameter holes.

The propelling unit of the Crawl-IR consists of steel crawler pads driven by two reversible and independently controlled air motors. Rubber-pad accessory equipment is also available. The oscillating type main frame is knee-action, which is said to permit tramming of the Crawl-IR over extremely rough terrain.

According to the manufacturer, the Crawl-IR, is available in two models. The "CM" unit is equipped with a hand-operated hydraulic pump used to position a single hydraulic boom lift cylinder. Horizontal positioning of the boom and positioning of the drill feed tower are manual on the "CM" unit.

The other model of the Crawl-IR is the "CM2" which, according to the manufacturer, is an all-power unit equipped with an air-motor-driven hydraulic pump. Two hydraulic cylinders operate the boom to swing it in a horizontal arc of 85 degrees and a vertical arc of 82 degrees. Three other cylinders position the drill guide feed tower for vertical, horizontal or angle drilling from any boom position.

The main boom is 5½ feet long and the feed tower is 15 feet high over-all and a 10-foot steel change is standard.

All controls are centrally located and the entire operation of positioning and drilling can easily, quickly and safely be done by one operator. When moving into drilling postion the Crawl-IR can operate as far from the compressed air supply as the air hose will allow.

After drilling has been completed and it is necessary to move the compressor, the drawbar of the compressor can be hooked to the crawler drill carriage for towing to the new drilling site. Equipment normally used to tow compressors and wagon drills need not be taken from other jobs.

The Crawl-IR, equipped with the D-45 super-power drifter, is recommended for drilling normal-depth blast holes ranging from 2¾ to 3½ inches in diameter. Without moving the rig, a maximum hole spacing of 10 feet is possible and horizontal holes can be drilled from ground level to 7 feet high.

Circle 1E on reply card

Small Parts Transported by Air

NOT A TOY railroad, but a vital production element, is the complex system of plastic pneumatic tubes used at General Motors' New Departure Division at Meriden, Conn. It was installed to deliver small ball bearings for electric motors to machines quickly enough to meet high-production quotas. With sweeping curves, zigzags and long straight sections, it looks much like a model transportation system of the future. Each tube has six interior rounded ridges or rails to support the pieces carried and prevent their wobbling. Plastic was used because tubes can be easily rearranged to accommodate changes in shop layout—cutting is easy and fitting it into place is quickly accomplished by relatively unskilled labor.

Parts leave a hopper in tubes and as they fall over an orifice through which high-velocity air is shot, are blown to the overhead tube races. Their speed is there retarded and they are then fed by gravity to various automatic grinding machines. From the machines they are similarly conveyed to final assembly and inspection stations. Another air jet recycles excess parts from machines back to the hopper. Air, operating at a pressure of 20 psi can transport 1600 inner and outer rings and 800 completed bearings every hour.

Metallic Vapor Coats Film

A PROCESS for placing highly reflective, metallic coatings on rolls of plastic film, textile fabrics and ultimately paper has been developed by the National Research Corporation of Cambridge, Mass. A roll of material to be metallized is placed in a tank, from which virtually all air is removed by a system of high-vacuum pumps. When the pressure has been reduced to about one millionth of atmospheric, the roll is unwound past a source of molten metal (usually aluminum) at a temperature of more than 2192°F. Metallic vapor condenses on the surface of the film as it passes, producing a very thin, brilliant coating. After the roll has passed the metal source and been rewound, the chamber is opened, it is removed and a new one inserted. Equipment in use can metallize strips up to 60 inches wide at a rate of about 400 feet per minute. The process has made possible the production of a virtually flawless metallized surface on Du Pont Mylar polyester film for metallic yarn, interior trim on automobiles, luggage, shoes and other similar applications.

Reclaiming Spent Pickling Liquor

IT HAS been estimated that approximately 600 million gallons of pickle liquor—a solution of ferrous sulphate and sulphuric acid that results from using sulphuric acid to clean scale and rust from metal—are wasted annually at the nation's steel mills. Disposal of this residue has been a constant problem to metallurgical industries. Conventional methods of neutralizing the acid with the cheapest available alkali cost nearly as much as the original cleaning acid. Many schemes have been tried but they have been expensive and have resulted in further by-products that, in themselves, created disposal problems.

Early in 1953, Dr. Othmar Ruthner of Vienna developed an inexpensive process by which the waste acid could be regenerated with hydrogen chloride and recycled through the pickling operation. The only by-product from this method, an iron oxide, can be recharged to the furnaces throughout the steel plant.

The spent liquor that contains 5-percent acid and 17-percent ferrous sulphate, according to the United States Steel Company, is first superheated and then discharged into an evaporator where a moderate vacuum allows excess water in the solution to evaporate at a low temperature. This concentrates the free acid in the liquor and at the same time reduces the solubility of the iron salts. The concentrated slurry of sulphuric acid and ferrous sulphate is cooled and pumped into reactors where hydrogen chloride gas is admitted. The result at this stage is a combination of ferrous chloride and sulphuric acid. These are separated in a centrifuge.

The ferrous chloride is fed to a multiple-hearth roaster where, under the influence of heat, it is converted to hydrogen chloride and iron oxide. The latter is then charged to blast furnaces and the hydrogen chloride is pumped into an absorber where a 21-percent hydrochloric acid solution is added to it. This produces hydrogen chloride gas, which is recycled to the reactors; and, hydrochloric acid, which is redelivered to the absorbers.

The sulphuric acid that had been separated in the centrifuge is stripped of hydrogen chloride and returned to the original pickling process.

A 3-year developmental program was begun by the Chemical Plants Division of Blaw-Knox Company of Pittsburgh, Pa., to adapt this system to American engineering standards. In October 1956, the first pilot plant was built at Niles, Ohio, at a cost of less than $500,000 and it began operating in September. Cosponsors of the project with Blaw-Knox Company are Jones and Laughlin Steel Corporation, National Steel Corporation, United States Steel Corporation, Pittsburgh Steel Company, Youngstown Sheet & Tube Company, Wheeling Steel Corporation and Republic Steel Corporation. Although it is still too early to form a concept for the future commercial use of the process, experience thus far has been satisfactory. It has been estimated that the daily cost of operating the Blaw-Knox Ruthner plant is about $170 whereas plants using the former lime neutralizing method show operating figures of about $540. In a 10-year period, savings are expected to be about $1,300,000.

"What the parking meter business needs most is rubber pipe."

Canals Lined With Asphalt Gunite

TEST COATING FOR CANAL

Mortar mixture of asphalt emulsion, portland cement, sand and water is sprayed over a canal bed by Johnson-Western Contractors. The lining is applied with modified guniting equipment.

ASPHALT concrete pneumatically placed by the gunite method as new lining for small canals or repairs for larger ones not only stands up well but also is comparable in cost to other sealing methods.

Asphalt emulsion mortar was applied in this manner on the Ridenbaugh Canal near Boise, Idaho, by the U.S. Bureau of Reclamation in 1947; however, a year later, deterioration from erosion and peeling was noted. Early in 1954, experimental installations were placed at Orland, Calif., to determine whether or not a rugged, water-impermeable, erosion-resistant, durable and pliable asphalt surface could be constructed by modifying the Idaho method. Following favorable results, a further test was run on the larger, unlined Madera Canal where considerable seepage and extreme erosion were taking place.

A mixture of sand and cement was fed to a nozzle by conventional gunite procedure with air at about 60-psi pressure. Water was introduced to a second nozzle from a separate ¾-inch hose. Emulsified asphalt at about 120 psi was delivered by a gear pump to a third nozzle. Asphalt and water proportions, checked hourly from quantities drawn from calibrated storage tanks, were controlled and adjusted by varying pump pressures and valve settings. During both tests, weather conditions were unfavorable.

These two projects, carried out by Johnson-Western Constructors, proved that work of this nature could be done during winter months, that the material would bond to old concrete linings, that the most desirable proportion of portland cement to asphalt gunite was from 3 to 5 percent and that either excessive or insufficient water content, respectively, caused the emulsion either to run down or rebound.

Industrial Notes

Channel-Flo is the name of a new Motorcompressor developed by Ingersoll-Rand Company for continuous duty. A 2-stage unit, it is rated at 200-psi discharge pressure and presently is available in 1½- and 2-hp sizes. The packaged unit is made up of the Motorcompressor, mounted on rubber isolators on a vertical receiver that meets American Society of Mechanical Engineers (ASME) Code requirements; an inlet muffler and filter; and all interconnecting piping and fittings. It is equipped with automatic start-and-stop control. The compressor which is directly mounted on a standard National Electrical Manufacturers Association (NEMA) C-face motor, is splash lubricated and, according to the manufacturer, has a

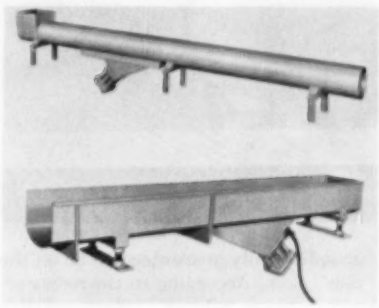
new piston-ring design that results in low oil consumption. The crankcase is totally enclosed.

The manufacturer claims important safety and space-saving features. Channel-Flo units require less than half the floor space of belt-driven, tank-mounted units of comparable size. The Motorcompressor itself can be mounted on a shelf, side wall or overhead with the air receiver located in an out-of-the-way place.

The unit derives its name from the Ingersoll-Rand Channel Valves used in both low- and high-pressure cylinders. The company uses the same type valve in its process compressors of up to 6000-hp. Its introduction in small compressors reportedly means less valve maintenance and longer service life.

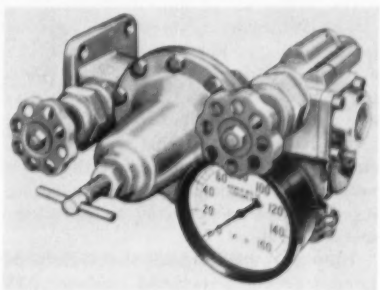
Circle 2E on reply card

A vibrating feeder that utilizes a pneumatic drive mechanism rather than the usual electric vibrator or motor has been developed by Cleveland Vibrator Company, 2828 Clinton Avenue, Cleveland, Ohio. It permits the moving of sand, gravel, fine powders such as cement and small parts up as great an incline as 20 degrees, it is claimed. Frequency of vibration is selected by varying the operating air pressure over a 30-to-90-psi range, thus controlling the feed rates.



Pan, trough or tubular construction models are available with a variety of section lengths and rates of feed. For detailed information about a specific application, write to the manufacturer giving material specifications and the rate of feed required.

Many controls required in air-pressure applications are combined in Republic Manufacturing Company's manifold line. Within the cast aluminum body is a pressure-reducing regulator, shut-off valve, strainer, blowdown valve, pressure gauge and its snubber and a check valve. Because of this combination, both installation time and cost are reduced. Headers with 2, 4, 6 or 8 stations enable the installation of many controls in one location; and when maintenance is required, because of sub-plate mounting,



defective parts are said to be easily removed and replaced. These units were originally designed to concentrate the air controls on presses, controlling clutches, service brakes, unloading devices and the like, and now they have been found valuable in applications where air pressure must be regulated and controlled. The original ¾- and 1-inch sizes have been supplemented by a ½-inch model.

Circle 3E on reply card

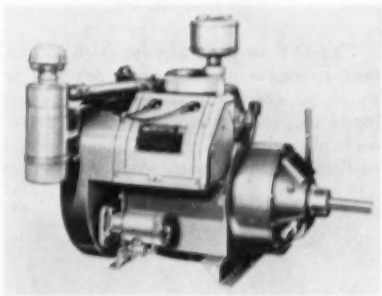
The Garlock Packing Company has announced two styles of asbestos-braid-jacket, plastic-core-valve stem packings for high-pressure and/or high-temperature service. Both use Inconel wire in the packing jacket. They are designated as Styles 5855 and 127.

The former is for general service where conditions are not extreme; that is for a top stuffing box temperature range of 500 to 600°F and pressures of several thousand pounds per square inch. It has a jacket composed of commercial asbestos yarn reinforced with the Inconel wire and a corrosion inhibitor.

Style 127 is for use with any fluid that does not affect the asbestos. It is suited for temperatures of 750°F and pressures of several thousand pounds per square inch. It will withstand considerable superheat and is said to be an excellent high-temperature oil refinery packing. The jacket is composed of 90-percent asbestos yarn and is reinforced as Style 5855 is.

Circle 4E on reply card

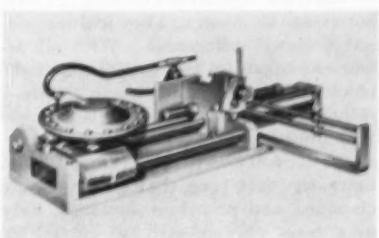
High torque design and stamina either for load-holding when handling inter-



mittent, variable loads or for continuous constant-load service, are incorporated in Model VR4D, an air-cooled 56-hp engine. Stellite exhaust valves and seat inserts are used with positive-type rotators for reportedly 200- to 500-percent longer valve life. Tapered, self-cleaning, main roller bearings on both ends of the crankshaft, a rotary type outside magneto, positive oil lubrication and efficient air cooling to 140°F are also featured. The machine is manufactured by Wisconsin Motor Corporation and is rated at 2200 rpm.

Circle 5E on reply card

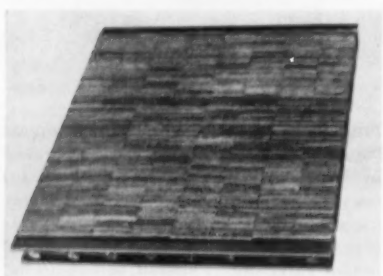
For feeding coiled stock into punch presses, Special Engineering Service, Inc., has developed a device called Ses-



Matic Air Feed. The fixtures are designed for direct mounting to bolster plates and presses. The only other connection required is a valve, mounted in such a manner as to be tripped by one of the moving parts of the press ram or die. Stock being fed is guided at both the front and rear of the unit. When the valve is tripped, a gripper assembly, connected to the end of the feed cylinder and guided by rigid bars, takes hold of the stock along one edge of its width with approximately 1600-psi pressure. It pulls the stock forward to the end of the feed stroke and releases it. A self-adjusting stock retainer takes hold while the gripper withdraws. Stock is always fed on the up-stroke of the press and length of feed is adjusted by a stroke-adjusting screw. Metal-to-metal stops assure close-tolerance duplication. The device can handle widths of 8, 12, and 18 inches in 8-, 12- and 18-inch lengths. No adjustment need be made to accommodate varying stock thicknesses. It is said that these units can be moved from one machine to another with a minimum of effort.

Circle 6E on reply card

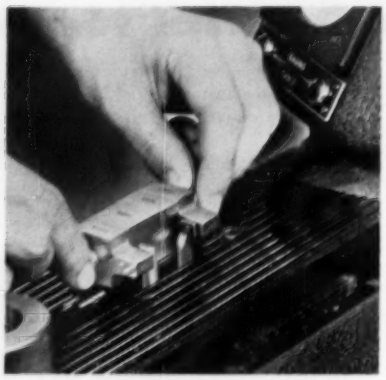
Flex-O floor pads are designed to protect products and prevent damage to floors by absorbing shocks from falling loads in production or assembly areas, on loading docks and the like. A product of Bumpers, Inc., they may be installed



on the floor surface or recessed into specially built pockets. They are made of steel channel frames and laminated segments of resilient rubber-reinforced fabric, and according to the manufacturer, are designed for heavy-duty service.

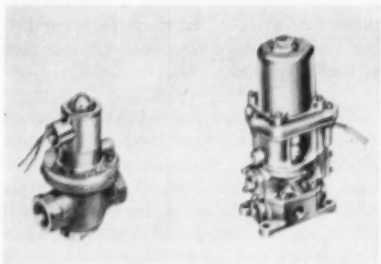
Circle 7E on reply card

Precision gauge blocks to control the closer tolerances required even in mass-produced parts, have been announced by Ellstrom Standards Division of Dearborn Gage Company. They feature "minus nothing" tolerances. With all deviations taken on the "plus" side, each block will wear to its nominal size—rather than away from it, as is the case with units having a possible minus tolerance. The closer tolerances are said to mark the first time that gauge blocks, classified and priced as standard, have ever been offered with all deviations



unconditionally guaranteed to be on the "plus" side. According to the manufacturer, "minus nothing" tolerances give users a minimum-wear factor that substantially increases useful service life.

Circle 8E on reply card



Starline is the name of a series of air-control valves that are said to provide modular construction for flexibility in various applications. Five pilot heads, interchangeable on seven valve bodies, combine with available pipe sizes to make 210 possible combinations.

The White Star valve (left) is composed of a spool-solenoid pilot head. According to Ross Operating Valve Company, maker of the line, it has a normal service life of more than 20 million cycles.

The Gold Star (right), built to JIC standards, consists of one of the seven valve bodies operated by a large-capacity pilot section actuated by an oil-immersed solenoid.

Blue Star includes all the remote piloted, pressure-operated valves—MV master valves for immediate actuation and instant reversal; TD, sequence timed-in valves; and WV, timed-out units.

All are built of corrosion-resistant materials and are more compact and lighter than present models. It is said that poppets have been improved to provide positive seal, self-alignment, split-second opening and closing and minimum maintenance.

Circle 9E on reply card

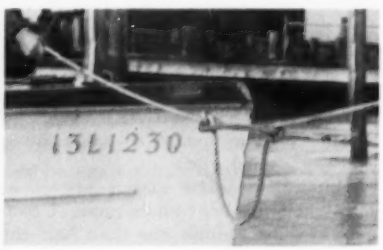
Lightweight safety spectacles for use in semihazardous operations such as light grinding, spot welding and laboratory work, have been developed by General Scientific Equipment Company. Lenses, available in clear or dark green, are molded of 0.06-inch thick, impact-resistant plastic. Reportedly frames will fit any face with minimum adjustments, thus only one size need be ordered. They fit easily over standard perscription-type glasses. Each is furnished with a paper, fleece-lined slide case.

Circle 10E on reply card

For applications on automatic-feed mechanisms, accurate-filling operations, control of valves, single acting cylinders and timing mechanisms, Barworth, Inc., has developed a 3-way, 2-position micro valve, Model No. 167. Reportedly the fixture has a capacity of from 0- to 100-psi pressure with air, water and gas and temperatures of from −30° to 200°F. Twelve ounces of force will move the toggle switch 8 degrees in either direction. The small, lightweight valve features an overcenter snap-action control.

Circle 11E on reply card

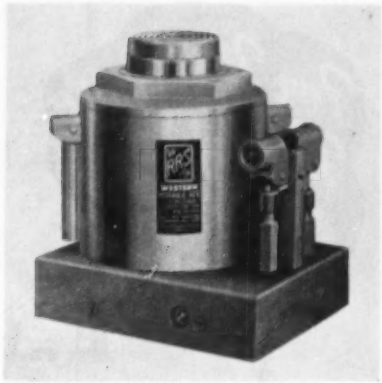
Taking the short, sharp shocks out of mooring lines to prevent their snapping is the job of a neoprene rubber shock absorber manufactured by Goodall Rubber Company and Griffith Rubber Mills.



The 20-inch-long rod has a diameter of ¾ inch and eyes in both ends through which the mooring line is threaded and made fast. Slack is left in the rope between the eyes. An elastic link and the line kept intact from the craft to the pier form a double insurance against complete connection breakage. Reportedly, Du Pont's neoprene will withstand rough handling in salt and fresh water, weathering and sunlight.

Circle 12E on reply card

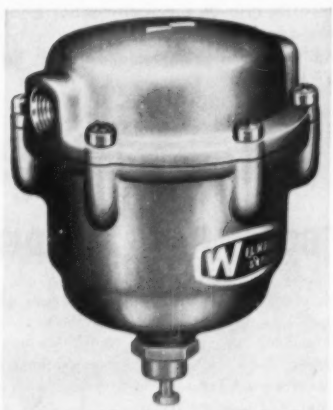
To meet increasing demands for higher capacity lifting jacks, Western Railroad Supply Company has added a 100-ton 2-speed hydraulic model (No. 100B-12) to its line. Of simple design and sturdy construction, the unit has a lifting height of 6⅛ inches. Low height and high capacity make it suitable for handling such extreme loads as are found in the erection of heavy equipment, machinery



moving and bridge building. By actuating both high-speed and high-lift plungers, the operator quickly brings the ram into contact with the load. Then, using the high-lift plunger alone, the load is easily raised. Dual release valves in the base can be operated from either side. The base reportedly can be drilled and tapped for a pressure gauge.

Circle 13E on reply card

Series 410 in-line moisture separators reportedly will separate and accumulate moisture and particulate contaminants as they pass through with the air flow. When the pneumatic system is turned off and pressure drops below 10 psi, the accumulations are automatically discharged. When returned to duty, they drain condensation that has been collected during the shut-off period and continue to do so until pressure in the system reaches 20 psi. At that time, the drain mechanism is resealed for further collection. The units, built by

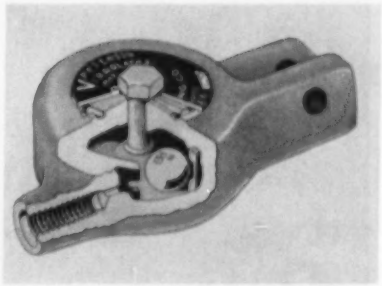


Wilkerson Corporation, have a maximum operating pressure of 250 psi and feature double-sealed automatic drains that can be quickly removed if cleaning becomes necessary.

Circle 14E on reply card

A steel ball speeding around a circular race under the impulse of compressed air produces the all-directional vibration of the Vibrolator, manufactured by Martin Engineering Company. The air enters one end of the unit and passes through a venturi nozzle to increase its velocity before being directed into the channel where the ball travels. After being used, the air is exhausted through ports in the center of the device. The air pressure ranges from 5 to 150 psi and the air consumption up to 19 cfm at 80-psi pressure.

Up to 50,000 vibrations per minute can be produced by this ingenious arrangement. The Vibrolator is made in various types and sizes to meet the requirements of different service conditions and the different types of materials that are to be vibrated. Some units are designed for horizontal mounting, others



for vertical, but all will operate in any position. One bantam-size model weighs only 8 ounces.

Typical applications are compacting

sand in foundry molding and rollover machines, facilitating the emptying of hoppers and bins and preventing the clogging or bridging of powdered or granular materials in chutes, silos, etc; screening materials and causing the lateral creeping movement of both solid and finely divided products.

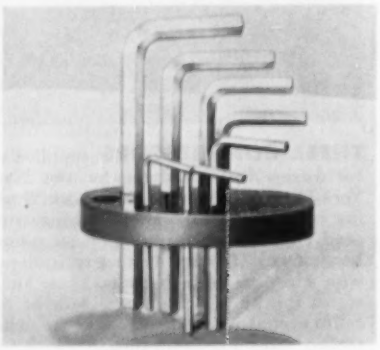
The device is claimed to operate quietly, even the sound of exhaust air being absent in the case of some models. It has only one moving part, the ball; it requires no lubrication and is self cleaning. Some units have operated out of sight, months without attention.

Circle 15E on reply card

National Electric Equipment Company has designed an instrument for locating hidden defects in machinery. Called Borescope, it consists of a long, needle-like tube with a tiny incandescent lamp and an objective lens in one end and in the other, an ocular lens and erecting prism. A series of achromatic intermediate lenses and wiring for the lamp run through the approximate 0.09-inch tube. According to the company, the device can be inserted through openings with diameters as small as 0.1 inch to view surfaces as far away as 20 feet. It is being used to read gauges in atomic reactors as well as to examine the insides of propeller blades, boiler tubes, engine cylinders, etc., for cracks and faults that would normally be detected only through time-consuming dismantling.

Circle 16E on reply card

A handy holder for L-type hex wrenches is produced by Hunter Tool Company. Made of a tough plastic material, the device reportedly is not affected by grease, oil or acid. It keeps the wrenches grouped and makes selection fast and easy. Handy, as it is called,



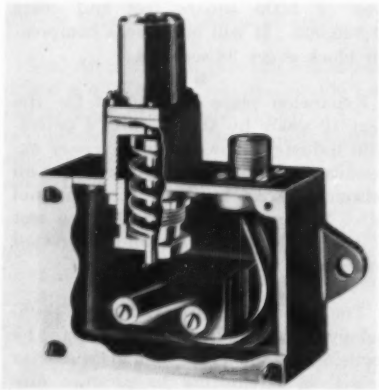
can be carried in the pocket or tool box. Its holes are slightly undersize so that wrenches are held snug, but can be easily withdrawn when needed. Two models are available: one holds a 7-key selection of sizes from 5/64 to 1/4 inches; and the other, a 10-piece group of sizes 1/20 to 5/16 inches.

Circle 17E on reply card

Tri-Metal Ladder Company has introduced an 8-to-12-step ladder of either ½- or ¾-inch-thick expanded metal. Metal steps and protective railings at the sides and top assure maximum personnel security. According to the manufacturer, the line features a simple-to-operate locking feature that raises casters and lowers front legs, locking them securely to the floor for prevention of tilting, swaying and slipping. They are available in grey, yellow, green or aluminum finish.

Circle 18E on reply card

Alloy Bellows Engineering Company is marketing a hydraulic and pneumatic pressure switch that operates, according to the company, on pressures from 0 to 1200 psi, and will withstand up to 3000 psi without distortion of the pressure element. Adjustments over the entire range may be easily made. Composed of



cast aluminum alloy, with stainless steel models available, the entire device is totally enclosed and weather proofed. It uses any micro switch, 15 amps, 120 to 460 volts, AC current, with single-pole double-throw silver contacts and can be mounted in any position on a wall or bracket. *Circle 19E on reply card*

BRIEFS

A report to the Lake Erie Watershed Conservation Foundation by Stanley Engineering Company, consultants, states that it is economically feasible to supply the 8-county greater metropolitan area of Cleveland and Akron, Ohio with water piped from Lake Erie. The report declares also that parts of the area will be in desperate need of the water as early as 1959. The Watershed Foundation is attempting to obtain legislation needed to start work on the project.

●

The U. S. Department of Defense has counted the number of separate items in its supply lists. The sum is a staggering 3,128,613 and the department hopes to reduce it considerably by standardization. The Government, it is reported, spends about 25 cents out of every dollar of income on just the durable or hard goods on the list. "Small business" prime contracts for defense goods account for 18.3 percent of the total expenditures.

●

During almost 100 years of operation, the Calumet Division of Calumet & Hecla, Inc., has produced 5 billion pounds of refined copper from its property in the Upper Peninsula of Michigan. Mining activity there rises and falls with the price of copper. The sharp increase in recent years led to the unwatering of the Osceola Shaft No. 13, a task that involved lifting 7 trillion gallons.

●

All machine operations—about 60 in number—will be performed automatically on small air conditioner compressors by a new transfer machine in the Chrysler Airtemp plant at Dayton, Ohio. The machine is 120 feet long, occupies an area of 5000 square feet and costs $1,500,000. It will machine a compressor block every 38 seconds.

●

Expansion plans announced for the next 10 years by this country's petroleum industry, along with necessary expenditures for maintenance, will cost an estimated $73.5 billion. An additional $41.5 billion will be spent by the rest of the world's oil firms and interested governments.

●

The National Nagoya Industrial Technology Research Institute in Japan, by focusing the sun's rays on a glass reactor vessel, is attempting to produce ammonia fertilizer from the reaction of nitrogen and hydrogen.

●

U.S. Industrial Chemicals Co., Division of National Distillers Products Corporation, predicts that its new sodium-reduction process will produce commercial-grade zirconium to sell for about $3.50 a pound instead of the present $10.

During the next 5 years, about 1000 engineering graduate students from India will receive a year's training in iron and steel technology in the United States, according to Ellesworth Bunker, U. S. Ambassador to that country. They will spend part of the time in foundries and steel plants; the rest in colleges near steel mills where they will study management practices and industrial relations. The program was developed by the two governments in conjunction with the Ford Foundation, American Iron and Steel Institute, United Steel Workers Union and Tata Iron and Steel Company, of India.

●

A nuclear battery, no bigger in diameter than the head of a thumb tack has been developed by Elgin National Watch Company, and Walter Kidde Nuclear Laboratories, Inc. The tiny power source has a nominal output of 20 microwatts and is expected to find uses in hearing aids, portable radios, electric wrist watches and the like. Although energized by the decay radiation from radioactive isotopes, it is said to be safe for personal use.

●

Two Swedish forestry experts have devised an instrument that automatically determines the age of trees. A combination of an electric computer and a microscope, it counts the concentric growth rings and also measures their widths. It is expected to prove useful in determining the relative inefficiences of different methods of caring for growing trees.

●

The Office of Technical Services, U. S. Department of Commerce, reports widespread substitution of plastic bearings for metal ones by German industry. Reportedly some plastics have better operating characteristics under adverse conditions than either bronze or steel.

●

Sen. Alan Bible of Nevada has introduced a bill in Congress to provide for the issuance of a special stamp in 1959 in commemoration of the one-hundredth anniversary of the discovery of the Comstock Lode at Virginia City.

●

South African gold mines drill, blast, load, hoist and treat more than 65 million tons of ore annually. Approximately 16,000 air-operated rock drills are employed.

●

In General Electric Company's modernized foundry at Elmira, N. Y., compressed air will act on rubber diaphragms to press sand over patterns firmly enough to form strong molds.

●

In 1956, for the fifth straight year, machines and machine parts led in air cargo carried by United Air Lines. The company has 200 cargo-carrying planes.

Industrial Literature

Specifications for horizontal and vertical straight-line automatic-transverse spray painting machines are described in a bulletin issued by The DeVilbiss Company. Horizontal and vertical contour models are also discussed, but they are specially built to meet individual requirements. Reportedly, both varieties feature uniformity of the applied film, luster, color and texture; established material control; and elimination of operator fatigue factors.

Circle 20E on reply card

Teflon used as sheathing for cables and insulation in motors, generators and transformers as well as in automotive, aviation, communications and electronics applications is the subject of Bulletin No. 200. It is the third of a series published by Halocarbon Division of Haveg Industries, Inc., the first two being Bulletins No. T-50 about Teflon as a material and T-100, which describes its use in lined steel pipe.

Circle 21E on reply card

Construction details of single- and double-seated Series 800 diaphragm control valves for applications where the flow of liquids, gases and steam are under a wide range of operating conditions are published in specifications S810-11 and S810-12, available from Minneapolis-Honeywell Regulator Company, Valve Division, Philadelphia 23, Pa. Sizes, materials, plug-characteristic curves, dimensions and a cross-section of each type are included.

Fire-safe cleaning of electrical motors, switch gear and dismantled parts can reportedly be handled by Solvent No. 5, a product of Magnus Chemical Company, Inc. Bulletin No. 300 describes its advantages, method of use and the necessary precautions that must be taken.

Circle 22E on reply card

Gries Reproducer Corporation's 67-item line of standard, small-sized zinc-alloy-cast and thermoplastic-molded products, as well as its contract production services are catalogued in its Services and Products *Bulletin*. It introduces the company's facilities for producing tiny components in volume and to exact specifications.

Circle 23E on reply card

Dial Springtime Anytime is a series of six colorful product folders prepared by the Airtemp Division, Chrysler Corporation to illustrate and present specification data on the company's commercial and residential air conditioning product lines.

Circle 24E on reply card

Heavy-duty, high-pressure hose couplings for air, steam, gas, hydraulic and liquid applications in the construction, mining, contracting and petroleum industries are described in Bulletin No. 115 issued by Le-Hi Division of Hose Accessories Company.

Circle 25E on reply card

Fulflo Filters for Water and Aqueous Liquids is a 4-page flyer released by Commercial Filters Corporation to describe its line of honeycomb filters. Capacities, operating pressures, pipe sizes and similar data are given for each of the five types of filters.

Circle 26E on reply card

Common conversions, as well as many hard-to-locate ones, such as quintals to pounds, cubic feet to liters, microns to meters, etc., are charted in a wall reference table by Precision Equipment Company.

Circle 27E on reply card

Maximum Automation Potential, known as M-A-P, a brochure issued by Coated Abrasives Division of The Carborundum Company, explains a free engineering service to predict performance of abrasive belts on any metal-removal operation, except snagging, in advance of expenditures for materials and equipment. Reportedly, predictions are proving better than 90-percent accurate, thus giving the customer a chance to compare present or planned metal-removal methods with the engineered abrasive-belt method.

Circle 28E on reply card

No. 4 Monograph, a portable shape-cutting torch machine, is described in respect to its cutting range, weight, dimensions, advantages and applications in Air Reduction Company, Inc.'s Catalogue No. 804E.

Circle 29E on reply card

Brush Electronics Company has published a folder illustrating and describing its direct-writing recording systems. It covers oscillographs, amplifiers, penmotor and accessories used with basic instruments.

Circle 30E on reply card

For readers interested in storage racks and bins, Sturdi-Bilt Engineering Company is offering two bulletins. The First, No. BB-956, covers steel bulk bins and contains charts for planning storage needs. The other, No. SR-956, suggests various uses for the line and includes photographs of installations. The system utilizes "Float Wedge" construction to permit assembly without the use of tools and fasteners so that the racks are instantly interchangeable, readjustable and removable.

Circle 31E on reply card

Aluminum products in a variety of colors can be made directly from roll-forming machines, press brakes, or draw or punch presses without subsequent finishing operations. Colorweld, a product of Reynolds Metals Company, makes this possible. It is a prefinished, pre-enameled aluminum coil available in ½- to 36-inch widths, and thicknesses of from 0.016 to 0.051 inch. The advantages are outlined in a brochure issued by the company.

Circle 32E on reply card

Bulletin BR-3A serves the double purpose of detailing the characteristics and installation advantages as well as operating instructions and descriptions of installation tools for Nylaflow tubing, a product of The Polymer Corporation of Pennsylvania. It is a pressure tubing for use with standard metallic flare or flareless fittings and is applicable in lubrication, hydraulic, pneumatic, instrumentation and beverage lines.

Circle 33E on reply card

For readers interested in heaters and heating devices, General Electric Company offers Bulletin No. GEC-1005H. The 72-page publication includes data, specifications, operating information and the manufacturer's recommended list prices for such fixtures as immersion, strip, cartridge, tubular, finned tubular and railroad switch heaters; unit heaters; soldering irons; soft-metal melting pots; and oven equipment.

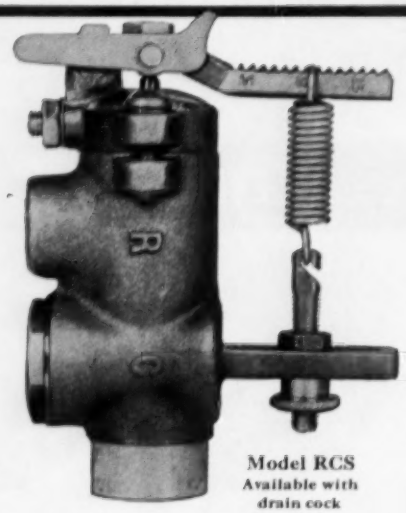
Circle 34E on reply card

Electrical Engineering Research facilities at Armour Research Foundation of Illinois Institute of Technology are described in five 4-page folders that explain research conducted in the fields of computer systems; electric machines, components and measurements; electronic instrumentation; communications and radio frequency applications; and control systems.

Circle 35E on reply card

CONRADER UNLOADER VALVES

Positive . . . Accurate . . . Dependable
Time-tested the World Over



Model RCS
Available with drain cock

New Designs—Smaller—More Compact

Positive operation in any position.

Adjustable differentials.

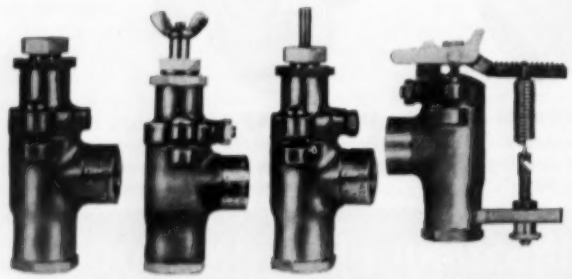
Operating pressures from 4 p.s.i. to 600 p.s.i.

Standard on leading compressors.

Conrader's exchange service trades you a completely rebuilt valve for an old one with new valve guarantee.

One day service on repairs.

Conrader is equipped to custom design special valves in pressures to 1000 p.s.i.



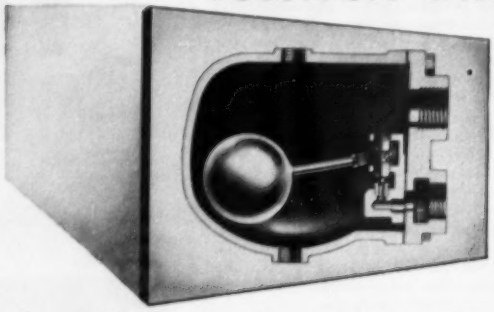
Model RCW | Model RCM-A with hand unloader | Model RCM-A | Model RCF

Distributor Franchises Open

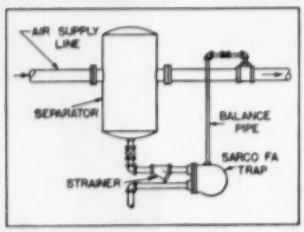
R. CONRADER COMPANY INC.
Box 924, Erie, Pa.

Circle 27A on reply card

Drain compressed air receivers with



SARCO FA DRAIN TRAPS



Type FA Trap draining separator.

. . . also your intercoolers, aftercoolers and separators. These traps automatically release condensate as it forms . . . without the waste of air that occurs when blowdown valves are used. New technical bulletin No. 5-CA offers many suggestions as to how you can increase the EFFECTIVE capacities of your air compressors. Write today for your free copy. No obligation . . . of course.

513

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SARCO CANADA, LTD., TORONTO 5, ONTARIO

Circle 28A on reply card

Here's 85 cfm of smooth, dependable

GYRO-FLO AIR POWER

for your small jobs

With the Gyro-Flo 85-cfm rotary compressor, you can save time, effort and expense on a host of small jobs where a larger compressor is not needed. This newest addition to the famous Ingersoll-Rand Gyro-Flo line weighs only 1840 lb as a complete portable unit, and only 1325 lb for truck mounting. For complete details, send for Form 2307.

Ingersoll-Rand
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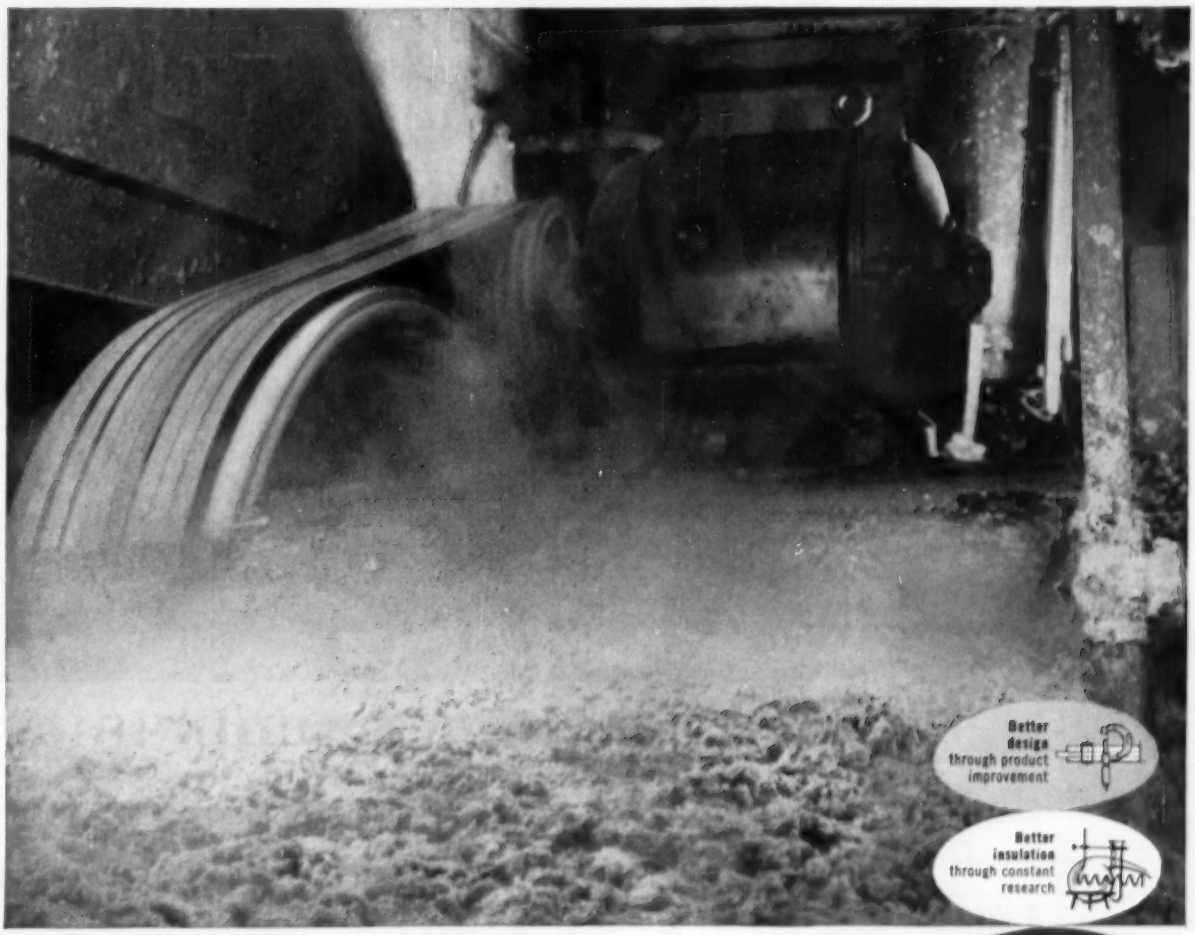

Moisture-laden hot-spot calls for some cool figuring!

Superior design of Louis Allis electric motors pays off under severe heat-humidity conditions

This paddle-agitator drive gets a steady bath of searing hot vapors from the trough below. Yet, the Louis Allis motor has given continuous and reliable service. Here are the special design techniques that make this possible:

Special attention to insulation—Louis Allis sponsors continuous research into new insulating materials. One example: Louis Allis engineers were first to combine Gilsonite with phenolics and alkyds. The result is a varnish with the highest degree of moisture, acid, and alkali resistance — extra-long life for all motor uses whatever your design problem.

Special care in manufacturing—Quality control of all materials . . . careful inspection . . . rigid test . . . all of these add up to the highest quality standards in the industry to assure you of continuous fine performance, dependability under any condition.

These and other Louis Allis extras—such as locked bearings for longer wear, positive lead identification for easier maintenance, and dynamically balanced rotor for quieter operation — could be the answer to your special design problems.

The complete story is in our Bulletin 1700. May we send it to you? Contact your nearby Louis Allis District Office or write The Louis Allis Company, 437 East Stewart Street, Milwaukee 1, Wisconsin.

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE-SPEED DRIVES

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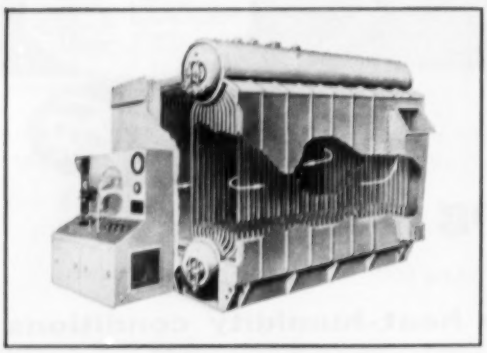
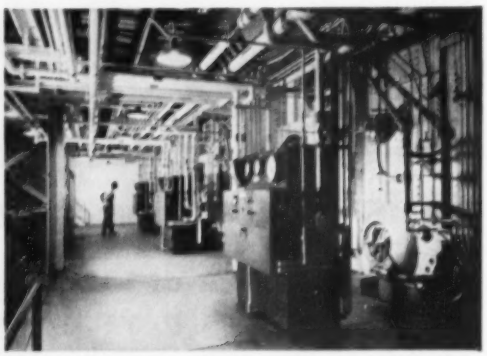
Architect's rendering of the Lake Meadows project. Skidmore, Owings and Merrill, Architects.

Chicago's newest planned community is served by C-E Boilers



Cutaway view of typical VP Boiler. For capacities from 4,000 to 40,000 lb of steam per hr. Pressures to 500 psi. Oil or gas fuel.



Firing aisle of the Lake Meadows boiler room showing three of the five C-E Package Boilers, Type VP.

Located on a 100 acre site overlooking Lake Michigan, Chicago's newest planned community, the Lake Meadows project, offers gracious living within the confines of a large city. Owned and managed by the New York Life Insurance Company, Lake Meadows provides distinctively appointed apartments, spacious grounds, a modern shopping center, ample parking facilities, yet is within minutes of the heart of the city. When completed, this project will house 2000 families and will include an eight acre park. Construction has already begun on a new elementary school located on two acres adjacent to the housing development.

A project of this size requires considerable steam capacity to provide ample heat and hot water as well as to perform the many other services required. To do the job, the New York Life Insurance Company originally selected three C-E Package Boilers, Type VP. Later, as new housing units were added, two additional VP Boilers were installed. Their outstanding performance and efficient, trouble-free operation is evidenced by the repeat order placed with Combustion for the final two units.

Complete information on C-E Package Boilers is available in Catalog VP-3. Write for your copy.

COMBUSTION ENGINEERING

B-9666

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

Canada: Combustion Engineering-Superheater Ltd.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS, PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

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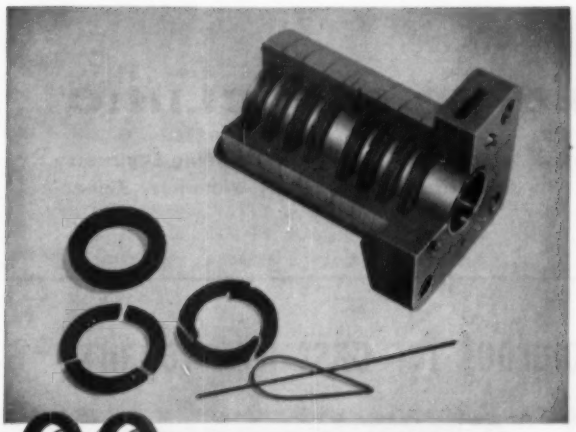

Look to COOK for Better CARBON PACKING RINGS!

Cook carbon packing rings are made of a special carbon graphite material that automatically assures you *high resistance to wear, chemical inertness and excellent heat conductivity.*

If you have sealing requirements for non-lubricated compressors, write today for a sample carbon ring, plus literature on Cook's complete line of packing materials. Address C. Lee Cook Company, 930 South Eighth Street, Louisville 3, Ky.

C. LEE COOK COMPANY

Sealing Pressures Since 1888

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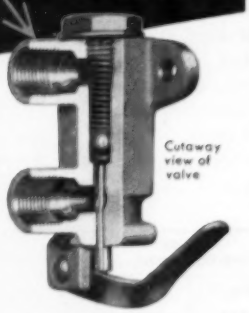
HEAVY DUTY PRESSURE SWITCH FOR AIR COMPRESSORS

Class 9013
Type ASG
Form X



Cutaway view of valve

COMPLETE RANGE IN 1 CONTROL UNIT

Either 20 to 180 or 25 to 250 PSI. No spring changes required.

MORE AIR CAPACITY

with improved 2-way ball and "O" ring type valve.

Write for Bulletin 9013A. Address Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE

SQUARE D COMPANY

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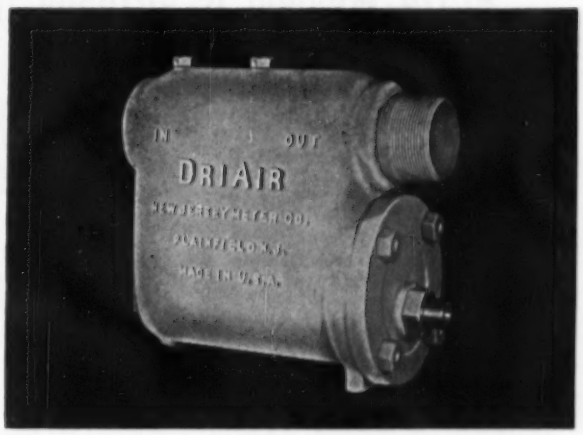
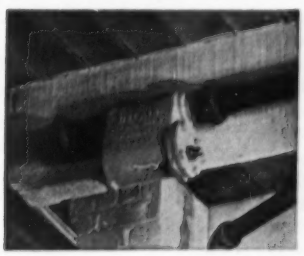
DEPENDABLE PNEUMATIC SERVICE



WHEN EQUIPMENT IS PROTECTED BY DRIAIR

A COMPLETE SELF-CONTAINED UNIT



DriAir may be installed by suspending it from the piping, without any other support, or may stand on the floor near equipment being protected.

DRIAIR speeds production by separating and automatically ejecting the condensed water and oil from the air. DriAir collects dirt and rust from the air lines and delivers clean dry air to the tools, thus reducing wear and prolonging their life. All internal parts are made of bronze or copper—resistant to corrosion and practically permanent. Copy of Bulletin DA fully describing the operation of DriAir sent on request.

NEW JERSEY METER COMPANY

PLAINFIELD, NEW JERSEY

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WELDING ROD CLINIC

J. Imperati and R. F. Pulver, Welding Engineers
The American Brass Company, Waterbury, Conn.

Braze Welding is virtually foolproof for cast iron repairs

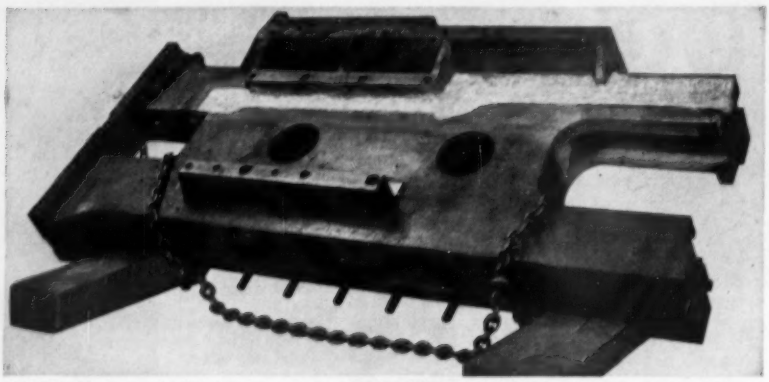
Low temperatures used give strong and enduring welds

The major obstacles to successful repair welding of cast iron are the low strength and poor ductility of cast iron weld metal, and the embrittlement and hardening produced by rapid cooling from welding temperatures.

Oxyacetylene fusion welds with cast iron rods have such very low strength and ductility that they often crack under the stresses imposed during welding and cooling. If they survive these hazards, they sometimes fail when subjected to the service stresses that caused the original failures.

On the other hand, severe embrittlement and hardening of weld and adjacent base metal are easily developed in arc welding because of the steep temperature gradients from weld to base metal. Here also, failure can occur during welding and cooling, or later in service. Usually the weld area is extremely hard and not machinable. It is often necessary to resort to extensive preheating, peening, post-heating, and annealing to avoid these twin evils.

Oxyacetylene braze welding is an excellent solution to the problem for two reasons. With the low temperatures required, there is no rapid cooling from high temperatures and therefore no embrittlement. Excellent ductility and high strength of the weld metal deposited by Tobin Bronze-481, Anaconda-997 (Low Fuming) Bronze, and Nickel Silver-828, permit yielding while the repairs are being made and after they are returned to service, and the danger of failure is practically eliminated.



A 7-foot fracture in this 6-ton press was repair welded in three days—20 hours preparation, 48 hours oxyacetylene welding time, using 400 lb. of Tobin Bronze-481 Welding Rod.

The braze-welding operation itself is virtually foolproof because the molten bronze automatically "tins out" or spreads over the joint surfaces when the correct temperature is reached. Since the base metal is not melted, control of the weld metal is very easy. Braze welding is readily done in all positions.

ADVANTAGES OF BRAZE WELDING WITH ANACONDA RODS ARE:

1. **Economy in welding time** and gas consumption.
2. **Development of low residual stresses** with less distortion and less tendency to crack.
3. **No embrittlement,** and complete machinability of the weld areas.
4. **Minimum delay** in returning the repaired parts to service.

DETAILED INFORMATION AVAILABLE

Detailed suggestions on the methods of chipping grooves, removing oil, positioning the work, and preheating are given in Publication B-13. This 32-page book gives a complete description and full information on Anaconda Welding Rods and discusses procedures for welding with copper and copper alloys in a wide variety of applications.

These are some of the subjects covered: Copper-Alloy Welding Rods in steel sheet metal work, brazing and soldering, resistance welding, surfacing, welding copper alloys to steel, arc-welding of copper and copper alloys.

For information on special problems—or for a copy of Publication B-13—write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

57109A

WELDING ROD	APPROX. COMPOSITION, %	APPROX. MELTING POINT	
		Deg. C	Deg. F
Tobin Bronze-481	59 copper, 0.60 tin, 40.40 zinc	885	1625
Anaconda-997 (Low Fuming) Bronze	57.80 copper, 40.27 zinc, 0.95 tin, 0.85 iron, 0.10 silicon and 0.03 manganese	870	1598
Nickel Silver-828	48.58 copper, 41 zinc, 10.25 nickel, 0.15 silicon, 0.02 phosphorus	930	1706

ANACONDA®
WELDING RODS

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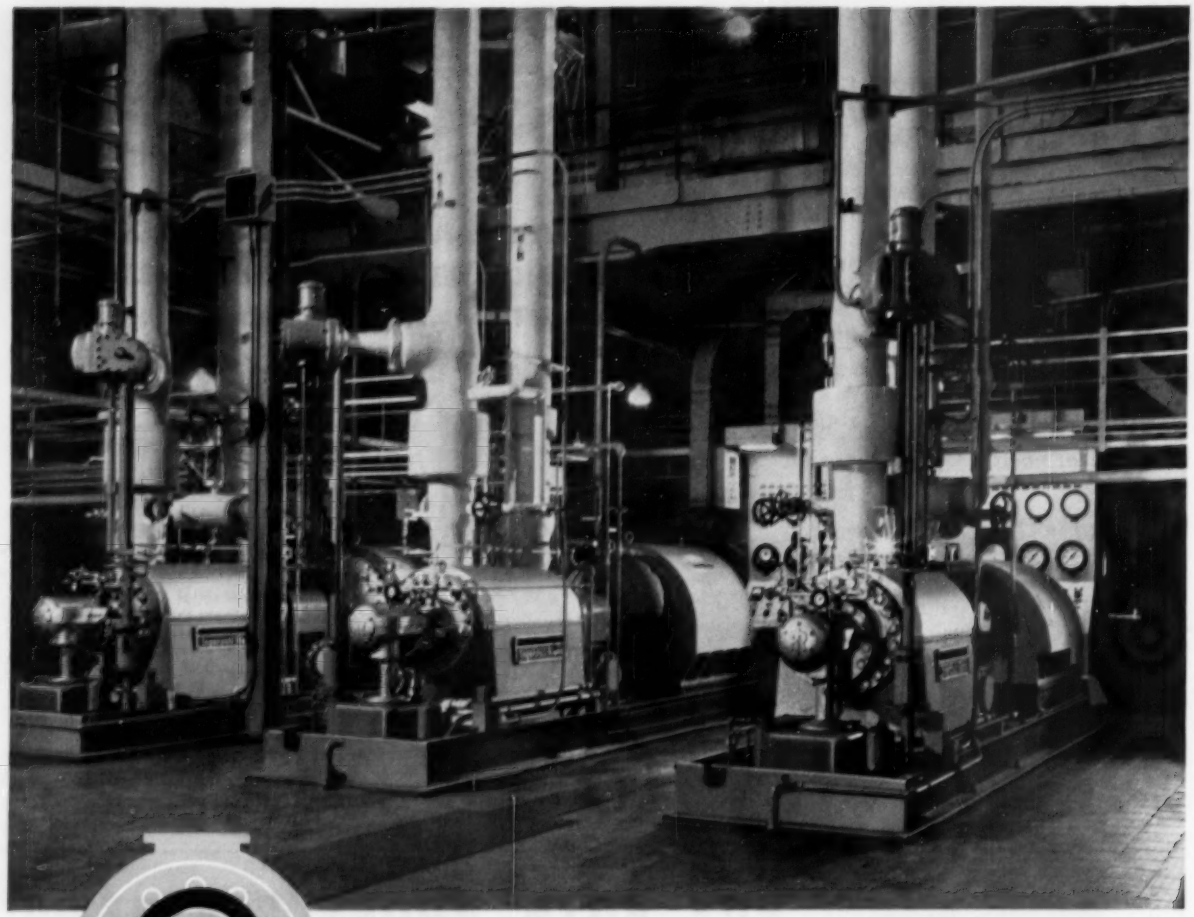

6 I-R BOILER FEED PUMPS

now serving ALL THREE Generating Units at

MUSTANG STATION

of Oklahoma Gas & Electric Co.

At its Mustang Station, Oklahoma Gas & Electric Company looks to Ingersoll-Rand boiler-feed pumps for the dependable, efficient supply of feedwater to all three of the station's generating units.

Pictured above are three of the four 1100-gpm, 1250-psi discharge units which serve 50-MW Units No. 1 and No 2. The new 100-MW Unit No. 3, put into operation in 1955, is served by another pair of Ingersoll-Rand boiler-feed pumps, each designed for 1770-gpm, 1900-psi discharge. While each generating unit is served by two pumps, each pump is capable of handling full unit load.

All six boiler-feed pumps are of proven Ingersoll-Rand heavy-duty, double-case design, featuring "unit-type" rotor construction to facilitate inspection and servicing.

Ingersoll-Rand boiler-feed pumps are the Power Industry's first choice where efficient performance and maximum dependability are prime considerations. They are available for all capacities and pressures, for any central station or industrial application. Your local I-R engineer can give you full details.

Ingersoll-Rand

10-571

11 BROADWAY, NEW YORK 4, N.Y.

COMPRESSORS · GAS & DIESEL ENGINES · PUMPS · AIR & ELECTRIC TOOLS · CONDENSERS · VACUUM EQUIPMENT · ROCK DRILLS

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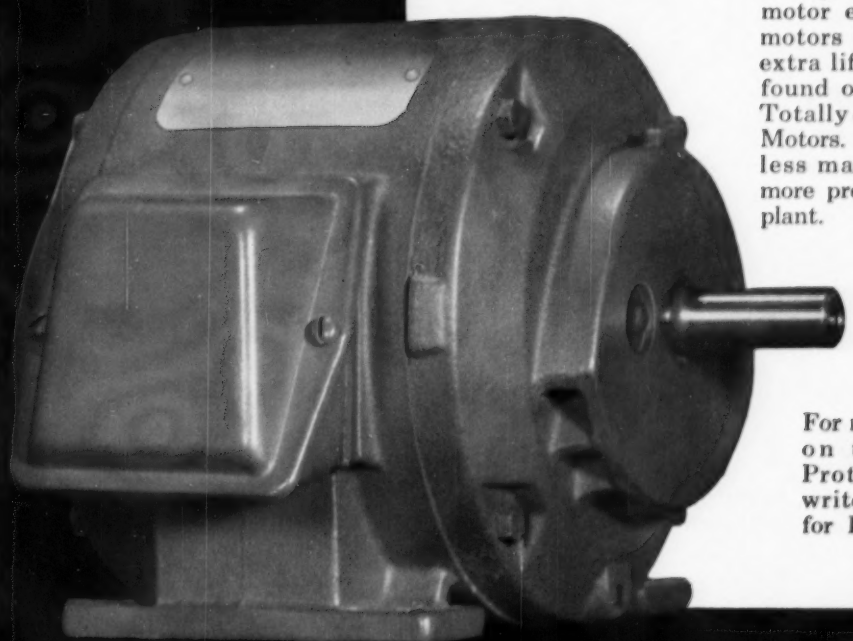
the world's only

TOTALLY-PROTECTED MOTOR

When we speak of Totally-Protected, we mean superior frame design with rigidity for heavy load conditions. We mean Metermatic bearing lubrication, acid and oil-proof insulation system, and motor leads, labeled and sealed in neoprene.

Totally-Protected means all this and more, but most of all it means a new concept of motor design and construction.

This Totally-Protected concept brings you a new motor efficiency. These motors have a built-in extra life—an extra life found only in Reliance Totally-Protected A-c. Motors. You profit from less maintenance and more production in your plant.



For more information on this Totally-Protected concept, write to Dept. 75A for Bulletin B-2401.

(B-1543)

RELIANCE R ELECTRIC

AND ENGINEERING COMPANY

CLEVELAND 17, OHIO • CANADIAN DIVISION: WELLAND, ONT.

Sales Offices and Distributors in Principal Cities

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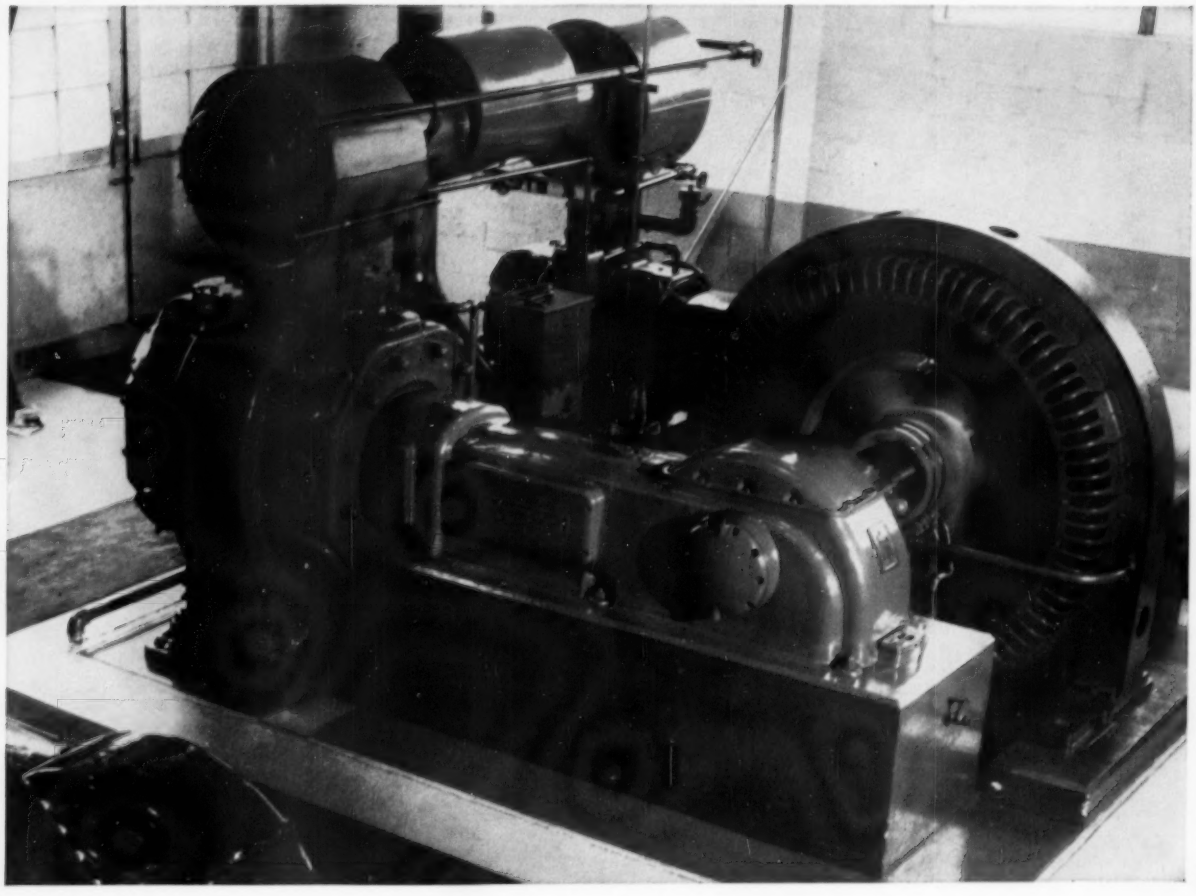

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Texaco Regal Oils R & O combine certain, positive advantages which help keep compressor operating efficiency high and maintenance costs low:

- ***Texaco Regal Oils R & O are refined from high grade crudes only.***
- **They are further fortified with special additives that keep compressors clean—free from rust and harmful deposits.**
- **They offer a complete line to handle every type and size compressor, every operating condition.**

Whichever you use, you can be sure it is exactly formulated to keep your compressor parts running free and whistle clean.

Texaco Lubrication Engineers have the training and experience to help you select the right *Texaco Regal Oils R & O* for your compressors—those that will keep operating efficiency high, maintenance costs low. Just call any of the more than 2,000 Texaco Distributing Plants in the 48 States. Or write to:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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TEXACO Regal Oils R&O

FOR ALL AIR COMPRESSORS AND OPERATING CONDITIONS

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